

SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS OFFEROR TO COMPLETE BLOCKS 12, 17, 23, 24, & 30					1. REQUISITION NUMBER PR-CI-04-10004		PAGE 1 OF						
2. CONTRACT NO.		3. AWARD/EFFECTIVE DATE		4. ORDER NUMBER		5. SOLICITATION NUMBER PR-CI-04-10004		6.SOLICITATION ISSUE DATE 10/16/2003					
7. FOR SOLICITATION INFORMATION CALL:		a. NAME SCOTT THARP				b. TELEPHONE NUMBER (No collect calls) 513 487-2092		8. OFFER DUE DATE/ LOCAL TIME 11/6/2003 12:00 PM					
9. ISSUED BY		CODE		10. THIS ACQUISITION IS <input checked="" type="checkbox"/> UNRESTRICTED <input type="checkbox"/> SET ASIDE: % FOR <input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> SMALL DISADV. BUSINESS <input type="checkbox"/> (B)(A) NAICS: 334519 SIZE STANDARD: 500		11. DELIVERY FOR FOB DESTINATION UNLESS BLOCK IS MARKED <input type="checkbox"/> SEE SCHEDULE 13a. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700) 13b. RATING 14. METHOD OF SOLICITATION <input type="checkbox"/> RFQ <input type="checkbox"/> IFB <input checked="" type="checkbox"/> RFP		12. DISCOUNT TERMS					
15. DELIVER TO		CODE		16. ADMINISTERED BY		CODE							
17a. CONTRACTOR/ OFFEROR		CODE		FACILITY CODE		18a. PAYMENT WILL BE MADE BY Environmental Protection Agency Research Triangle Park Financial Management Center (D143-02) Research Triangle Park, NC 27711							
TELEPHONE NO. <input type="checkbox"/> 17b. CHECK IF REMITTANCE IS DIFFERENT AND PUT SUCH ADDRESS IN OFFER						18b. SUBMIT INVOICES TO ADDRESS SHOWN IN BLOCK 18a. UNLESS BLOCK BELOW IS CHECKED <input type="checkbox"/> SEE ADDENDUM							
19. ITEM NO.		20. SCHEDULE OF SUPPLIES/SERVICES SEE ATTACHED DOCUMENTS (Attach Additional sheets as Necessary)				21. QUANTITY		22. UNIT		23. UNIT PRICE		24. AMOUNT	
25. ACCOUNTING AND APPROPRIATION DATA N/A						26. TOTAL AWARD AMOUNT (For Govt. Use Only)							
<input type="checkbox"/> 27a. SOLICITATION INCORPORATES BY REFERENCE FAR 52.212-1, 52.212-4. FAR 52.212-3 AND 52.212-5 ARE ATTACHED. <input type="checkbox"/> ARE <input type="checkbox"/> ARE NOT ATTACHED.													
<input type="checkbox"/> 27b. CONTRACT/PURCHASE ORDER INCORPORATES BY REFERENCE FAR 52.212-4. FAR 52.212-5 IS ATTACHED. ADDENDA <input type="checkbox"/> ARE <input type="checkbox"/> ARE NOT ATTACHED.													
28. CONTRACTOR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN COPIES <input type="checkbox"/> TO ISSUING OFFICE. CONTRACTOR AGREES TO FURNISH AND DELIVER ALL ITEMS SET FORTH OR OTHERWISE IDENTIFIED ABOVE AND ON ANY ADDITIONAL SHEETS SUBJECT TO THE TERMS AND CONDITIONS SPECIFIED HEREIN.						29. AWARD OF CONTRACT: REFERENCE _____ OFFER <input type="checkbox"/> DATED _____, YOUR OFFER ON SOLICITATION (BLOCK 5), INCLUDING ANY ADDITIONS OR CHANGES WHICH ARE SET FORTH HEREIN, IS ACCEPTED AS TO ITEMS:							
30a. SIGNATURE OF OFFEROR/CONTRACTOR						31a. UNITED STATES OF AMERICA (SIGNATURE OF CONTRACTING OFFICER)							
30b. NAME AND TITLE OF SIGNER (TYPE OR PRINT)				30c. DATE SIGNED		31b. NAME OF CONTRACTING OFFICER (TYPE OR PRINT) DAVID H. PLAGGE				31c. DATE SIGNED			
32a. QUANTITY IN COLUMN 21 HAS BEEN <input type="checkbox"/> RECEIVED <input type="checkbox"/> INSPECTED <input type="checkbox"/> ACCEPTED AND CONFORMS TO THE <input type="checkbox"/> CONTRACT, EXCEPT AS NOTED						33. SHIP NUMBER <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL		34. VOUCHER NUMBER		35. AMOUNT VERIFIED CORRECT FOR			
32b. SIGNATURE OF AUTHORIZED GOVT. REPRESENTATIVE						32c. DATE		36. PAYMENT <input type="checkbox"/> COMPLETE <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL				37. CHECK NUMBER	
41a. I CERTIFY THIS ACCOUNT IS CORRECT AND PROPER FOR PAYMENT						42a. RECEIVED BY (Print)				40. PAID BY			
41b. SIGNATURE AND TITLE OF CERTIFYING OFFICER				41c. DATE		42b. RECEIVED AT (Location)							
						42c. DATE REC'D (YY/MM/DD)		42d. TOTAL CONTAINERS					
AUTHORIZED FOR LOCAL REPRODUCTION SEE REVERSE FOR OMB CONTROL NUMBER AND PAPERWORK STANDARD FORM 1449 (10-95) BURDEN STATEMENT Prescribed by GSA - FAR (48 CFR) 53.212													

<p>Public reporting burden for this collection of information is estimated to average 45 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (VRS), Office of Federal Acquisition Policy, GSA, Washington, DC 20405.</p>	<p>OMB NO: 9000-0136 Expires: 09/30/98</p>
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1. **CONTRACT TERMS AND CONDITIONS -- COMMERCIAL ITEMS (FAR 52.212-4) (FEB 2002) DEVIATION**

(a) *Inspection/Acceptance.* The Contractor shall only tender for acceptance those items that conform to the requirements of this contract. The Government reserves the right to inspect or test any supplies or services that have been tendered for acceptance. The Government may require repair or replacement of nonconforming supplies or reperformance of nonconforming services at no increase in contract price. The Government must exercise its post-acceptance rights --

(1) Within a reasonable time after the defect was discovered or should have been discovered; and

(2) Before any substantial change occurs in the condition of the item, unless the change is due to the defect in the item.

(b) *Assignment.* The Contractor or its assignee may assign its rights to receive payment due as a result of performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency in accordance with the Assignment of Claims Act (31 U.S.C.3727). However, when a third party makes payment (e.g., use of the Governmentwide commercial purchase card), the Contractor may not assign its rights to receive payment under this contract.

(c) *Changes.* Changes in the terms and conditions of this contract may be made only by written agreement of the parties.

(d) *Disputes.* This contract is subject to the Contract Disputes Act of 1978, as amended (41 U.S.C. 601-613). Failure of the parties to this contract to reach agreement on any request for equitable adjustment, claim, appeal or action arising under or relating to this contract shall be a dispute to be resolved in accordance with the clause at FAR 52.233-1, Disputes, which is incorporated herein by reference. The Contractor shall proceed diligently with performance of this contract, pending final resolution of any dispute arising under the contract.

(e) *Definitions.* The clause at FAR 52.202-1, Definitions, is incorporated herein by reference.

(f) *Excusable delays.* The Contractor shall be liable for default unless nonperformance is caused by an occurrence beyond the reasonable control of the Contractor and without its fault or negligence such as, acts of God or the public enemy, acts of the Government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, unusually severe weather, and delays of common carriers. The Contractor shall notify the Contracting Officer in writing as soon as it is reasonably possible after the commencement of any excusable delay, setting forth the full

particulars in connection therewith, shall remedy such occurrence with all reasonable dispatch, and shall promptly give written notice to the Contracting Officer of the cessation of such occurrence.

(g) *Invoice.* (1) The Contractor shall submit an original invoice and three copies (or electronic invoice, if authorized) to the address designated in the contract to receive invoices. An invoice must include--

- (i) Name and address of the Contractor;
- (ii) Invoice date and number;
- (iii) Contract number, contract line item number and, if applicable, the order number;
- (iv) Description, quantity, unit of measure, unit price and extended price of the items delivered;
- (v) Shipping number and date of shipment, including the bill of lading number and weight of shipment if shipped on Government bill of lading;
- (vi) Terms of any discount for prompt payment offered;
- (vii) Name and address of official to whom payment is to be sent;
- (viii) Name, title, and phone number of person to notify in event of defective invoice; and
- (ix) Taxpayer Identification Number (TIN). The Contractor shall include its TIN on the invoice only if required elsewhere in this contract.
- (x) Electronic funds transfer (EFT) banking information.

(A) The Contractor shall include EFT banking information on the invoice only if required elsewhere in this contract.

(B) If EFT banking information is not required to be on the invoice, in order for the invoice to be a proper invoice, the Contractor shall have submitted correct EFT banking information in accordance with the applicable solicitation provision, contract clause (e.g., 52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration, or 52.232-34, Payment by Electronic Funds Transfer--Other Than Central Contractor Registration), or applicable agency procedures.

(C) EFT banking information is not required if the Government waived the requirement to pay by EFT.

(2) INVOICE PREPARATION AND SUBMISSION

Contractors shall submit invoices upon delivery and acceptance of all supplies or services unless otherwise specified in the contract. Invoices shall be submitted as follows:

One (1) original and two (2) copies of the invoice to:

U.S. Environmental Protection Agency
Research Triangle Park Financial Management Center
(Mail Code D143-02)
Research Triangle Park, NC 27711

One (1) copy of the invoice to the Project Officer designated in the clause entitled "Contract Administration Representatives" (EP 52.242.100).

One (1) copy of the invoice to the Contracting Officer designated in the clause entitled "Contract Administration Representatives" (EP 52.242.100).

(3) Invoices will be handled in accordance with the Prompt Payment Act (31 U.S.C. 3903) and Office of Management and Budget (OMB) prompt payment regulations at 5 CFR part 1315.

(h) *Patent indemnity.* The Contractor shall indemnify the Government and its officers, employees and agents against liability, including costs, for actual or alleged direct or contributory infringement of, or inducement to infringe, any United States or foreign patent, trademark or copyright, arising out of the performance of this contract, provided the Contractor is reasonably notified of such claims and proceedings.

(i) *Payment.* Payment shall be made for items accepted by the Government that have been delivered to the delivery destinations set forth in this contract. The Government will make payment in accordance with the Prompt Payment Act (31 U.S.C. 3903) and OMB prompt payment regulations at 5 CFR part 1315. In connection with any discount offered for early payment, time shall be computed from the date of the invoice. For the purpose of computing the discount earned, payment shall be considered to have been made on the date which appears on the payment check or the specified payment date if an electronic funds transfer payment is made.

(j) *Risk of loss.* Unless the contract specifically provides otherwise, risk of loss or damage to the supplies provided under this contract shall remain with the Contractor until, and shall pass to the Government upon:

(1) Delivery of the supplies to a carrier, if transportation is f.o.b. origin; or

(2) Delivery of the supplies to the Government at the destination specified in the contract, if transportation is f.o.b. destination.

(k) *Taxes.* The contract price includes all applicable Federal, State, and local taxes and duties.

(l) *Termination for the Government's convenience.* The Government reserves the right to terminate this contract, or any part hereof, for its sole convenience. In the event of such termination, the Contractor shall immediately stop all work hereunder and shall immediately cause any and all of its suppliers and subcontractors to cease work. Subject to the terms of this contract, the Contractor shall be paid a percentage of the contract price reflecting the percentage of the work performed prior to the notice of termination, plus reasonable charges the Contractor can demonstrate to the satisfaction of the Government using its standard record keeping system, have resulted from the termination. The Contractor shall not be required to comply with the cost accounting standards or contract cost principles for this purpose. This paragraph does not give the Government any right to audit the Contractor's records. The Contractor shall not be paid for any work performed or costs incurred which reasonably could have been avoided.

(m) *Termination for cause.* The Government may terminate this contract, or any part hereof, for cause in the event of any default by the Contractor, or if the Contractor fails to comply with any contract terms and conditions, or fails to provide the Government, upon request, with adequate assurances of future performance. In the event of termination for cause, the Government shall not be liable to the Contractor for any amount for supplies or services not accepted, and the Contractor shall be liable to the Government for any and all rights and remedies provided by law. If it is determined that the Government improperly terminated this contract for default, such termination shall be deemed a termination for convenience.

(n) *Title.* Unless specified elsewhere in this contract, title to items furnished under this contract shall pass to the Government upon acceptance, regardless of when or where the Government takes physical possession.

(o) *Warranty.* The Contractor warrants and implies that the items delivered hereunder are merchantable and fit for use for the particular purpose described in this contract.

(p) *Limitation of liability.* Except as otherwise provided by an express warranty, the Contractor will not be liable to the Government for consequential damages resulting from any defect or deficiencies in accepted items.

(q) *Other compliances.* The Contractor shall comply with all applicable Federal, State and local laws, executive orders, rules and regulations applicable to its performance under this contract.

(r) *Compliance with laws unique to Government contracts.* The Contractor agrees to comply with 31 U.S.C. 1352 relating to limitations on the use of

appropriated funds to influence certain Federal contracts; 18 U.S.C. 431 relating to officials not to benefit; 40 U.S.C. 327, et seq., Contract Work Hours and Safety Standards Act; 41 U.S.C. 51-58, Anti-Kickback Act of 1986; 41 U.S.C. 265 and 10 U.S.C. 2409 relating to whistleblower protections; 49 U.S.C. 40118, Fly American; and 41 U.S.C. 423 relating to procurement integrity.

(s) *Order of precedence.* Any inconsistencies in this solicitation or contract shall be resolved by giving precedence in the following order:

- (1) The schedule of supplies/services.
- (2) The Assignments, Disputes, Payments, Invoice, Other Compliances, and Compliance with Laws Unique to Government Contracts paragraphs of this clause.
- (3) The clause at 52.212-5.
- (4) Addenda to this solicitation or contract, including any license agreements for computer software.
- (5) Solicitation provisions if this is a solicitation.
- (6) Other paragraphs of this clause.
- (7) The Standard Form 1449.
- (8) Other documents, exhibits, and attachments.
- (9) The specification.

2. CONTRACT TERMS AND CONDITIONS REQUIRED TO IMPLEMENT STATUTES OR EXECUTIVE ORDERS -- COMMERCIAL ITEMS (FAR 52.212-5) (JUN 2003)

(a) The Contractor shall comply with the following Federal Acquisition Regulation (FAR) clause, which is incorporated in this contract by reference, to implement provisions of law or Executive orders applicable to acquisitions of commercial items: 52.233-3, Protest after Award (AUG 1996) (31 U.S.C. 3553).

(b) The Contractor shall comply with the FAR clauses in this paragraph (b) that the Contracting Officer has indicated as being incorporated in this contract by reference to implement provisions of law or Executive orders applicable to acquisitions of commercial items:

[Contracting Officer check as appropriate.]

X_(1) 52.203-6, Restrictions on Subcontractor Sales to the Government (JUL 1995), with Alternate I (OCT 1995) (41 U.S.C. 253g and 10 U.S.C. 2402).

__(2) 52.219-3, Notice of Total HUBZone Set-Aside (JAN 1999) (15 U.S.C. 657a).

__(3) 52.219-4, Notice of Price Evaluation Preference for HUBZone Small Business Concerns (JAN 1999) (if the offeror elects to waive the preference, it shall so indicate in its offer) (15 U.S.C. 657a).

__(4)(i) 52.219-5, Very Small Business Set-Aside (JUNE 2003) (Pub. L. 103-403, section 304, Small Business Reauthorization and Amendments Act of 1994).

__(ii) Alternate I (MAR 1999) of 52.219-5.

__(iii) Alternate II (JUNE 2003) of 52.219-5.

__(5)(i) 52.219-6, Notice of Total Small Business Set-Aside (JUNE 2003) (15 U.S.C. 644).

__(ii) Alternate I (OCT 1995) of 52.219-6.

__(6)(i) 52.219-7, Notice of Partial Small Business Set-Aside (JUNE 2003) (15 U.S.C. 644).

__(ii) Alternate I (OCT 1995) of 52.219-7.

X_(7) 52.219-8, Utilization of Small Business Concerns (OCT 2000) (15 U.S.C. 637 (d)(2) and (3)).

__(8)(i) 52.219-9, Small Business Subcontracting Plan (JAN 2002) (15

U.S.C. 637(d)(4)).

___(ii) Alternate I (OCT 2001) of 52.219-9.

___(iii) Alternate II (OCT 2001) of 52.219-9.

___(9) 52.219-14, Limitations on Subcontracting (DEC 1996) (15 U.S.C. 637(a)(14)).

___(10)(i) 52.219-23, Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns (JUNE 2003) (Pub. L. 103-355, section 7102, and 10 U.S.C. 2323) (if the offeror elects to waive the adjustment, it shall so indicate in its offer).

___(ii) Alternate I (JUNE 2003) of 52.219-23.

___(11) 52.219-25, Small Disadvantaged Business Participation Program--Disadvantaged Status and Reporting (OCT 1999) (Pub.L. 103-355, section 7102, and 10 U.S.C. 2323).

___(12) 52.219-26, Small Disadvantaged Business Participation Program--Incentive Subcontracting (OCT 2000) (Pub. L. 103-355, section 7102, and 10 U.S.C. 2323).

X_(13) 52.222-3, Convict Labor (JUNE 2003) (E.O. 11755).

X_(14) 52.222-19, Child Labor--Cooperation with Authorities and Remedies (SEP 2002) (E.O. 13126).

X_(15) 52.222-21, Prohibition of Segregated Facilities (FEB 1999).

X_(16) 52.222-26, Equal Opportunity (APR 2002) (E.O. 11246).

X_(17) 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans (DEC 2001) (38 U.S.C. 4212).

X_(18) 52.222-36, Affirmative Action for Workers with Disabilities (JUN 1998) (29 U.S.C. 793).

X_(19) 52.222-37, Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans (DEC 2001) (38 U.S.C. 4212).

___(20)(i) 52.223-9, Estimate of Percentage of Recovered Material Content for EPA-Designated Products (AUG 2000) (42 U.S.C. 6962(c)(3)(A)(ii)).

___(ii) Alternate I (AUG 2000) of 52.223-9 (42 U.S.C. 6962(i)(2)(C)).

__(21) 52.225-1, Buy American Act--Supplies (JUNE 2003) (41 U.S.C. 10a-10d).

__(22)(i) 52.225-3, Buy American Act--North American Free Trade Agreement--Israeli Trade Act (JUNE 2003) (41 U.S.C. 10a-10d, 19 U.S.C. 3301 note, 19 U.S.C. 2112 note).

__(ii) Alternate I (MAY 2002) of 52.225-3.

__(iii) Alternate II (MAY 2002) of 52.225-3.

X_(23) 52.225-5, Trade Agreements (JUNE 2003) (19 U.S.C. 2501, et seq., 19 U.S.C. 3301 note).

X_(24) 52.225-13, Restrictions on Certain Foreign Purchases (JUNE 2003) (E.O. 12722, 12724, 13059, 13067, 13121, and 13129).

__(25) 52.225-15, Sanctioned European Union Country End Products (FEB 2000) (E.O. 12849).

__(26) 52.225-16, Sanctioned European Union Country Services (FEB 2000) (E.O. 12849).

__(27) 52.232-29, Terms for Financing of Purchases of Commercial Items (FEB 2002) (41 U.S.C. 255(f), 10 U.S.C. 2307(f)).

X_(28) 52.232-30, Installment Payments for Commercial Items (OCT 1995) (41 U.S.C. 255(f), 10 U.S.C. 2307(f)).

X_(29) 52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration (MAY 1999) (31 U.S.C. 3332).

__(30) 52.232-34, Payment by Electronic Funds Transfer--Other than Central Contractor Registration (MAY 1999) (31 U.S.C. 3332).

__(31) 52.232-36, Payment by Third Party (MAY 1999) (31 U.S.C. 3332).

__(32) 52.239-1, Privacy or Security Safeguards (AUG 1996) (5 U.S.C. 552a).

__(33)(i) 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (APR 2003) (46 U.S.C. Appx 1241 and 10 U.S.C. 2631).

__(ii) Alternate I (APR 1984) of 52.247-64.

(c) The Contractor shall comply with the FAR clauses in this paragraph (c), applicable to commercial services, that the Contracting Officer has indicated as being incorporated in this contract by reference to implement provisions of law or Executive orders applicable to acquisitions of commercial items:

[Contracting Officer check as appropriate.]

___(1) 52.222-41, Service Contract Act of 1965, as Amended (MAY 1989) (41 U.S.C. 351, *et seq.*).

___(2) 52.222-42, Statement of Equivalent Rates for Federal Hires (MAY 1989) (29 U.S.C. 206 and 41 U.S.C. 351, *et seq.*).

___(3) 52.222-43, Fair Labor Standards Act and Service Contract Act--Price Adjustment (Multiple Year and Option Contracts) (MAY 1989) (29 U.S.C. 206 and 41 U.S.C. 351, *et seq.*).

___(4) 52.222-44, Fair Labor Standards Act and Service Contract Act--Price Adjustment (February 2002) (29 U.S.C. 206 and 41 U.S.C. 351, *et seq.*).

___(5) 52.222-47, SCA Minimum Wages and Fringe Benefits Applicable to Successor Contract Pursuant to PreDecemberessor Contractor Collective Bargaining Agreements (CBA) (May 1989) (41 U.S.C. 351, *et seq.*).

(d) *Comptroller General Examination of Record.* The Contractor shall comply with the provisions of this paragraph (d) if this contract was awarded using other than sealed bid, is in excess of the simplified acquisition threshold, and does not contain the clause at 52.215-2, Audit and Records -- Negotiation.

(1) The Comptroller General of the United States, or an authorized representative of the Comptroller General, shall have access to and right to examine any of the Contractor's directly pertinent records involving transactions related to this contract.

(2) The Contractor shall make available at its offices at all reasonable times the records, materials, and other evidence for examination, audit, or reproduction, until 3 years after final payment under this contract or for any shorter period specified in FAR Subpart 4.7, Contractor Records Retention, of the other clauses of this contract. If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement. Records relating to appeals under the disputes clause or to litigation or the settlement of claims arising under or relating to this contract shall be made available until such appeals, litigation, or claims are finally resolved.

(3) As used in this clause, records include books, documents, accounting procedures and practices, and other data, regardless of type and regardless of form. This does not require the Contractor to create or maintain any record that the Contractor does not maintain in the ordinary course of business or pursuant to a provision of law.

(e)(1) Notwithstanding the requirements of the clauses in paragraphs (a),

(b), (c), and (d) of this clause, the Contractor is not required to flow down any FAR clause, other than those in paragraphs (i) through (vi) of this paragraph in a subcontract for commercial items. Unless otherwise indicated below, the extent of the flow down shall be as required by the clause--

(i) 52.219-8, Utilization of Small Business Concerns (October 2000) (15 U.S.C. 637(d)(2) and (3)), in all subcontracts that offer further subcontracting opportunities. If the subcontract (except subcontracts to small business concerns) exceeds \$500,000 (\$1,000,000 for construction of any public facility), the subcontractor must include 52.219-8 in lower tier subcontracts that offer subcontracting opportunities.

(ii) 52.222-26, Equal Opportunity (April 2002) (E.O. 11246).

(iii) 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans (December 2001) (38 U.S.C. 4212).

(iv) 52.222-36, Affirmative Action for Workers with Disabilities (June 1998) (29 U.S.C. 793).

(v) 52.222-41, Service Contract Act of 1965, as Amended (May 1989), flow down required for all subcontracts subject to the Service Contract Act of 1965 (41 U.S.C. 351, *et seq.*).

(vi) 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (April 2003) (46 U.S.C. Appx 1241 and 10 U.S.C. 2631). Flow down required in accordance with paragraph (d) of FAR clause 52.247-64.

(2) While not required, the contractor may include in its subcontracts for commercial items a minimal number of additional clauses necessary to satisfy its contractual obligations.

3. INSTRUCTIONS TO OFFERORS -- COMMERCIAL ITEMS (FAR 52.212-1) (OCT 2000)

(a) *North American Industry Classification System (NAICS) code and small business size standard.* The NAICS code and small business size standard for this acquisition appear in Block 10 of the solicitation cover sheet (SF 1449). However, the small business size standard for a concern which submits an offer in its own name, but which proposes to furnish an item which it did not itself manufacture, is 500 employees.

(b) *Submission of offers.* Submit signed and dated offers to the office specified in this solicitation at or before the exact time specified in this solicitation. Offers may be submitted on the SF 1449, letterhead stationery, or as otherwise specified in the solicitation. As a minimum, offers must show--

- (1) The solicitation number;
- (2) The time specified in the solicitation for receipt of offers;
- (3) The name, address, and telephone number of the offeror;
- (4) A technical description of the items being offered in sufficient detail to evaluate compliance with the requirements in the solicitation. This may include product literature, or other documents, if necessary;
- (5) Terms of any express warranty;
- (6) Price and any discount terms;
- (7) "Remit to" address, if different than mailing address;
- (8) A completed copy of the representations and certifications at FAR 52.212-3;
- (9) Acknowledgment of Solicitation Amendments;
- (10) Past performance information, when included as an evaluation factor, to include recent and relevant contracts for the same or similar items and other references (including contract numbers, points of contact with telephone numbers and other relevant information); and
- (11) If the offer is not submitted on the SF 1449, include a statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation. Offers that fail to furnish required representations or information, or reject the terms and conditions of the solicitation may be excluded from consideration.

(c) *Period for acceptance of offers.* The offeror agrees to hold the prices

in its offer firm for 30 calendar days from the date specified for receipt of offers, unless another time period is specified in an addendum to the solicitation.

(d) *Product samples.* When required by the solicitation, product samples shall be submitted at or prior to the time specified for receipt of offers. Unless otherwise specified in this solicitation, these samples shall be submitted at no expense to the Government, and returned at the sender's request and expense, unless they are destroyed during preaward testing.

(e) *Multiple offers.* Offerors are encouraged to submit multiple offers presenting alternative terms and conditions or commercial items for satisfying the requirements of this solicitation. Each offer submitted will be evaluated separately.

(f) *Late submissions, modifications, revisions, and withdrawals of offers.*
 (1) Offerors are responsible for submitting offers, and any modifications, revisions, or withdrawals, so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that offers or revisions are due.

(2)(i) Any offer, modification, revision, or withdrawal of an offer received at the Government office designated in the solicitation after the exact time specified for receipt of offers is ``late'' and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and--

(A) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of offers; or

(B) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government's control prior to the time set for receipt of offers; or

(C) If this solicitation is a request for proposals, it was the only proposal received.

(ii) However, a late modification of an otherwise successful offer, that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(3) Acceptable evidence to establish the time of receipt at the

Government installation includes the time/date stamp of that installation on the offer wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(4) If an emergency or unanticipated event interrupts normal Government processes so that offers cannot be received at the Government office designated for receipt of offers by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation or other notice of an extension of the closing date, the time specified for receipt of offers will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(5) Offers may be withdrawn by written notice received at any time before the exact time set for receipt of offers. Oral offers in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile offers, offers may be withdrawn via facsimile received at any time before the exact time set for receipt of offers, subject to the conditions specified in the solicitation concerning facsimile offers. An offer may be withdrawn in person by an offeror or its authorized representative if, before the exact time set for receipt of offers, the identity of the person requesting withdrawal is established and the person signs a receipt for the offer.

(g) *Contract award (not applicable to Invitation for Bids)*. The Government intends to evaluate offers and award a contract without discussions with offerors. Therefore, the offeror's initial offer should contain the offeror's best terms from a price and technical standpoint. However, the Government reserves the right to conduct discussions if later determined by the Contracting Officer to be necessary. The Government may reject any or all offers if such action is in the public interest; accept other than the lowest offer; and waive informalities and minor irregularities in offers received.

(h) *Multiple awards*. The Government may accept any item or group of items of an offer, unless the offeror qualifies the offer by specific limitations. Unless otherwise provided in the Schedule, offers may not be submitted for quantities less than those specified. The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit prices offered, unless the offeror specifies otherwise in the offer.

(i) Availability of requirements documents cited in the solicitation.
(1)(i) The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29, and copies of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained for a fee by submitting a request to--

GSA Federal Supply Service Specifications Section,

Suite 8100,
470 East L'Enfant Plaza, SW, Washington, DC 20407,
Telephone (202) 619-8925,
Facsimile (202) 619-8978.

(ii) If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (i)(1)(i) of this provision. Additional copies will be issued for a fee.

(2) The DoD Index of Specifications and Standards (DoDISS) and documents listed in it may be obtained from the--

Department of Defense Single Stock Point (DoDSSP),
Building 4, Section D,
700 Robbins Avenue,
Philadelphia, PA 19111-5094,
Telephone (215) 697- 2667/2179,
Facsimile (215) 697-1462.

(i) Automatic distribution may be obtained on a subscription basis.

(ii) Order forms, pricing information, and customer support information may be obtained--

(A) By telephone at (215) 697-2667/2179; or

(B) Through the DoDSSP Internet site at <http://assist.daps.mil>.

(3) Nongovernment (voluntary) standards must be obtained from the organization responsible for their preparation, publication, or maintenance.

(j) Data Universal Numbering System (DUNS) Number. (Applies to offers exceeding \$25,000.) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation ``DUNS'' followed by the DUNS number that identifies the offeror's name and address. If the offeror does not have a DUNS number, it should contact Dun and Bradstreet to obtain one at no charge. An offeror within the United States may call 1-800-333-0505. The offeror may obtain more information regarding the DUNS number, including locations of local Dun and Bradstreet Information Services offices for offerors located outside the United States, from the Internet home page at <http://www.customerservice@dnb.com>. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at globalinfo@mail.dnb.com.

4. EVALUATION -- COMMERCIAL ITEMS (FAR 52.212-2) (JAN 1999)

(a) The Government will award a contract resulting from this solicitation to the responsible offeror whose offer conforming to the solicitation will be most advantageous to the Government, price and other factors considered. The following factors shall be used to evaluate offers:

SEE ATTACHED TECHNICAL EVALUATION CRITERIA

For this solicitation, technical factors are significantly more important than cost.

(b) *Options.* The Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. The Government may determine that an offer is unacceptable if the option prices are significantly unbalanced. Evaluation of options shall not obligate the Government to exercise the option(s).

(c) A written notice of award or acceptance of an offer, mailed or otherwise furnished to the successful offeror within the time for acceptance specified in the offer, shall result in a binding contract without further action by either party. Before the offer's specified expiration time, the Government may accept an offer (or part of an offer), whether or not there are negotiations after its receipt, unless a written notice of withdrawal is received before award.

5. OFFEROR REPRESENTATIONS AND CERTIFICATIONS -- COMMERCIAL ITEMS (FAR 52.212-3) (JUN 2003)

(a) *Definitions.* As used in this provision:

"Emerging small business" means a small business concern whose size is no greater than 50 percent of the numerical size standard for the NAICS code designated.

"Forced or indentured child labor" means all work or service-

(1) Exacted from any person under the age of 18 under the menace of any penalty for its nonperformance and for which the worker does not offer himself voluntarily; or

(2) Performed by any person under the age of 18 pursuant to a contract the enforcement of which can be accomplished by process of penalties.

"Service-disabled veteran-owned small business concern"-

(1) Means a small business concern-

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern" means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and size standards in this solicitation.

"Veteran-owned small business concern" means a small business concern-

(1) Not less than 51 percent of which is owned by one or more veterans(as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned business concern" means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the its stock is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

"Women-owned small business concern" means a small business concern --

(1) That is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(b) *Taxpayer identification number (TIN)* (26 U.S.C. 6109, 31 U.S.C. 7701). (Not applicable if the offeror is required to provide this information to a central contractor registration database to be eligible for award.)

(1) All offerors must submit the information required in paragraphs (b)(3) through (b)(5) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the Internal Revenue Service (IRS).

(2) The TIN may be used by the government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.]

(3) Taxpayer Identification Number (TIN).

[] TIN:_____.

[] TIN has been applied for.

[] TIN is not required because:

[] Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

☐ Offeror is an agency or instrumentality of a foreign government;

☐ Offeror is an agency or instrumentality of the Federal Government;

(4) Type of organization.

☐ Sole proprietorship;

☐ Partnership;

☐ Corporate entity (not tax-exempt);

☐ Corporate entity (tax-exempt);

☐ Government entity (Federal, State, or local);

☐ Foreign government;

☐ International organization per 26 CFR 1.6049-4;

☐ Other _____.

(5) Common parent.

☐ Offeror is not owned or controlled by a common parent:

☐ Name and TIN of common parent:

Name _____

TIN _____

(c) Offerors must complete the following representations when the resulting contract will be performed in the United States or its outlying areas. Check all that apply.

(1) *Small business concern.* The offeror represents as part of its offer that it ☐ is, ☐ is not a small business concern.

(2) *Veteran-owned small business concern.* [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.] The offeror represents as part of its offer that it ☐ is, ☐ is not a veteran-owned small business concern.

(3) *Service-disabled veteran-owned small business concern.* [Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (c)(2) of this provision.] The offeror represents as part

of its offer that it ☐ is, ☐ is not a service-disabled veteran-owned small business concern.

(4) *Small disadvantaged business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.]* The offeror represents, for general statistical purposes, that it ☐ is, ☐ is not, a small disadvantaged business concern as defined in 13 CFR 124.1002.

(5) *Women-owned small business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.]* The offeror represents that it ☐ is, ☐ is not a women-owned small business concern.

Note: Complete paragraphs (c)(6) and (c)(7) only if this solicitation is expected to exceed the simplified acquisition threshold.

(6) *Women-owned business concern (other than small business concern). [Complete only if the offeror is a women-owned business concern and did not represent itself as a small business concern in paragraph (c)(1) of this provision.]* The offeror represents that it ☐ is, a women-owned business concern.

(7) *Tie bid priority for labor surplus area concerns.* If this is an invitation for bid, small business offerors may identify the labor surplus areas in which costs to be incurred on account of manufacturing or production (by offeror or first-tier subcontractors) amount to more than 50 percent of the contract price:

(8) *Small Business Size for the Small Business Competitiveness Demonstration Program and for the Targeted Industry Categories under the Small Business Competitiveness Demonstration Program. [Complete only if the offeror has represented itself to be a small business concern under the size standards for this solicitation.]*

(i) *[Complete only for solicitations indicated in an addendum as being set-aside for emerging small businesses in one of the four designated industry groups (DIGs).]* The offeror represents as part of its offer that it ☐ is, ☐ is not an emerging small business.

(ii) *[Complete only for solicitations indicated in an addendum as being for one of the targeted industry categories (TICs) or four designated industry groups (DIGs).]* Offeror represents as follows:

(A) Offeror's number of employees for the past 12 months (check

the Employees column if size standard stated in the solicitation is expressed in terms of number of employees); or

(B) Offeror's average annual gross revenue for the last 3 fiscal years (check the Average Annual Gross Number of Revenues column if size standard stated in the solicitation is expressed in terms of annual receipts).

(Check one of the following):

Number of Employees	Average Annual Gross Revenues
<input type="checkbox"/> 50 or fewer	<input type="checkbox"/> \$1 million or less
<input type="checkbox"/> 51-100	<input type="checkbox"/> \$1,000,001-\$2 million
<input type="checkbox"/> 101-250	<input type="checkbox"/> \$2,000,001-\$3.5 million
<input type="checkbox"/> 251-500	<input type="checkbox"/> \$3,500,001-\$5 million
<input type="checkbox"/> 501-750	<input type="checkbox"/> \$5,000,001-\$10 million
<input type="checkbox"/> 751-1,000	<input type="checkbox"/> \$10,000,001-\$17 million
<input type="checkbox"/> Over 1,000	<input type="checkbox"/> Over \$17 million

(9) *[Complete only if the solicitation contains the clause at FAR 52.219-23, Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns, or FAR 52.219-25, Small Disadvantaged Business Participation Program-Disadvantaged Status and Reporting, and the offeror desires a benefit based on its disadvantaged status.]*

(i) *General.* The offeror represents that either-

(A) It ☐ is, ☐ is not certified by the Small Business Administration as a small disadvantaged business concern and identified, on the date of this representation, as a certified small disadvantaged business concern in the database maintained by the Small Business Administration (PRO-Net), and that no material change in disadvantaged ownership and control has occurred since its certification, and, where the concern is owned by one or more individuals claiming disadvantaged status, the net worth of each individual upon whom the certification is based does not exceed \$750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); or

(B) It ☐ has, ☐ has not submitted a completed application to the Small Business Administration or a Private Certifier to be certified as a small disadvantaged business concern in accordance with 13 CFR 124, Subpart B, and a decision on that application is pending, and that no material change in disadvantaged ownership and control has occurred since its application was submitted.

(ii) ☐ *Joint Ventures under the Price Evaluation Adjustment for Small Disadvantaged Business Concerns.* The offeror represents, as part of its offer, that it is a joint venture that complies with the requirements in 13

CFR 124.1002(f) and that the representation in paragraph (c)(9)(i) of this provision is accurate for the small disadvantaged business concern that is participating in the joint venture. *[The offeror shall enter the name of the small disadvantaged business concern that is participating in the joint venture: _____.]*

(10) *HUBZone small business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.]* The offeror represents, as part of its offer, that--

(i) It [] is, [] is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It [] is, [] is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (c)(10)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. *[The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture:_____.]* Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(d) *Representations required to implement provisions of Executive Order 11246* --(1) Previous contracts and compliance. The offeror represents that --

(i) It [] has, [] has not, participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation; and

(ii) It [] has, [] has not, filed all required compliance reports.

(2) Affirmative Action Compliance. The offeror represents that --

(i) It [] has developed and has on file, [] has not developed and does not have on file, at each establishment, affirmative action programs required by rules and regulations of the Secretary of Labor (41 CFR parts 60-1 and 60-2), or

(ii) It [] has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

(e) *Certification Regarding Payments to Influence Federal Transactions (31 U.S.C. 1352).* (Applies only if the contract is expected to exceed \$100,000.) By submission of its offer, the offeror certifies to the best of its knowledge

and belief that no Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with the award of any resultant contract.

(f) *Buy American Act Certificate.* (Applies only if the clause at Federal Acquisition Regulation (FAR) 52.225-1, Buy American Act--Supplies, is included in this solicitation.)

(1) The offeror certifies that each end product, except those listed in paragraph (f)(2) of this provision, is a domestic end product and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The offeror shall list as foreign end products those end products manufactured in the United States that do not qualify as domestic end products. The terms "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act--Supplies."

(2) Foreign End Products:

LINE ITEM NO.	COUNTRY OF ORIGIN
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>

[List as necessary]

(3) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25.

(g)(1) *Buy American Act -- North American Free Trade Agreement -- Israeli Trade Act Certificate.* (Applies only if the clause at FAR 52.225-3, Buy American Act - North American Free Trade Agreement Israeli Trade Act, is included in this solicitation.)

(i) The offeror certifies that each end product, except those listed in paragraph (g)(1)(ii) or (g)(1)(iii) of this provision, is a domestic end product and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The terms "component," "domestic end product," "end product," "foreign end product," and "United States" are defined in the clause of this solicitation entitled "Buy American Act--North American Free Trade Agreement--Israeli Trade Act."

(ii) The offeror certifies that the following supplies are NAFTA country end products or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act-North American Free Trade Agreement-Israeli Trade Act":

NAFTA Country or Israeli End Products:

LINE ITEM NO.	COUNTRY OF ORIGIN
_____	_____
_____	_____
_____	_____

[List as necessary]

(iii) The offeror shall list those supplies that are foreign end products (other than those listed in paragraph (g)(1)(ii) or this provision) as defined in the clause of this solicitation entitled "Buy American Act-North American Free Trade Agreement-Israeli Trade Act." The offeror shall list as other foreign end products those end products manufactured in the United States that do not qualify as domestic end products.

Other Foreign End Products:

LINE ITEM NO.	COUNTRY OF ORIGIN
_____	_____
_____	_____
_____	_____

[List as necessary]

(iv) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25.

(2) *Buy American Act--North American Free Trade Agreements--Israeli Trade Act Certificate, Alternate I (May 2002)*. If Alternate I to the clause at FAR 52.225-3 is included in this solicitation, substitute the following paragraph (g)(1)(ii) for paragraph (g)(1)(ii) of the basic provision:

(g)(1)(ii) The offeror certifies that the following supplies are Canadian end products as defined in the clause of this solicitation entitled ``Buy American Act--North American Free Trade Agreement--Israeli Trade Act':

Canadian End Products:

Line Item No.

(List as necessary)

(3) Buy American Act--North American Free Trade Agreements--Israeli Trade Act Certificate, Alternate II (May 2002). If Alternate II to the clause at FAR 52.225-3 is included in this solicitation, substitute the following paragraph (g)(1)(ii) for paragraph (g)(1)(ii) of the basic provision:

(g)(1)(ii) The offeror certifies that the following supplies are Canadian end products or Israeli end products as defined in the clause of this solicitation entitled ``Buy American Act--North American Free Trade Agreement-Israeli Trade Act'':

Canadian or Israeli End Products:

LINE ITEM NO.	COUNTRY OF ORIGIN
<hr/>	<hr/>
<hr/>	<hr/>
<hr/>	<hr/>

[List as necessary]

(4) *Trade Agreements Certificate*. (Applies only if the clause at FAR 52.225-5, Trade Agreements, is included in this solicitation.)

(i) The offeror certifies that each end product, except those listed in paragraph (g)(4)(ii) of this provision, is a U.S.-made, designated country, Caribbean Basin country, or NAFTA country end product, as defined in the clause of this solicitation entitled "Trade Agreements."

(ii) The offeror shall list as other end products those end products that are not U.S.-made, designated country, Caribbean Basin country, or NAFTA country end products.

Other End Products

LINE ITEM NO.	COUNTRY OF ORIGIN
<hr/>	<hr/>

[List as necessary]

(iii) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25. For line items subject to the Trade Agreements Act, the Government will evaluate offers of U.S.-made, designated country, Caribbean Basin country, or NAFTA country end products without regard to the restrictions of the Buy American Act. The Government will consider for award only offers of U.S.-made, designated country, Caribbean Basin country, or NAFTA country end products unless the Contracting Officer determines that there are no offers for such products or that the offers for such products are insufficient to fulfill the requirements of the solicitation.

(h) *Certification Regarding Debarment, Suspension or Ineligibility for Award (Executive Order 12549)*. (Applies only if the contract value is expected to exceed the simplified acquisition threshold.) The offeror certifies, to the best of its knowledge and belief, that the offeror and/or any of its principals--

(1) ☐ Are, ☐ are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency; and

(2) ☐ Have, ☐ have not, within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a Federal, state or local government contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property; and

(3) ☐ Are, ☐ are not presently indicted for, or otherwise criminally or civilly charged by a Government entity with, commission of any of these offenses.

(i) *Certification Regarding Knowledge of Child Labor for Listed End Products (Executive Order 13126)*. [The Contracting Officer must list in paragraph (i)(1) any end products being acquired under this solicitation that are included in the List of Products Requiring Contractor Certification as to Forced or Indentured Child Labor, unless excluded at 22.1503(b).]

(1) *Listed End Product*

Listed End Product

Listed Countries of Origin:

(2) *Certification. [If the Contracting Officer has identified end products and countries of origin in paragraph (i)(1) of this provision, then the offeror must certify to either (i)(2)(i) or (i)(2)(ii) by checking the appropriate block.]*

☐ (i) The offeror will not supply any end product listed in paragraph (i)(1) of this provision that was mined, produced, or manufactured in the corresponding country as listed for that product.

☐ (ii) The offeror may supply an end product listed in paragraph (i)(1) of this provision that was mined, produced, or manufactured in the corresponding country as listed for that product. The offeror certifies that it has made a good faith effort to determine whether forced or indentured child labor was used to mine, produce, or manufacture any such end product furnished under this contract. On the basis of those efforts, the offeror certifies that it is not aware of any such use of child labor.

ATTACHMENT 1

ADDENDUM TO FAR CLAUSE 52.212-4

1. EVALUATION OF OPTIONS (FAR 52.217-5) (JUL 1990)

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirements. Evaluation of options will not obligate the Government to exercise the option(s).

2. SITE VISIT (FAR 52.237-1) (APR 1984)

Offerors or quoters are urged and expected to inspect the site where services are to be performed and to satisfy themselves regarding all general and local conditions that may affect the cost of contract performance, to the extent that the information is reasonably obtainable. In no event shall failure to inspect the site constitute grounds for a claim after contract award.

3. COMPLIANCE WITH EPA POLICIES FOR INFORMATION RESOURCES MANAGEMENT (EPAAR 1552.211-79) (OCT 2000)

(a) Definition. Information Resources Management (IRM) is defined as any planning, budgeting, organizing, directing, training, promoting, controlling, and managing activities associated with the burden, collection, creation, use and dissemination of information. IRM includes both information itself, and the management of information and related resources such as personnel, equipment, funds, and technology. Examples of these services include but are not limited to the following:

(1) The acquisition, creation, or modification of a computer program or automated data base for delivery to EPA or use by EPA or contractors operating EPA programs.

(2) The analysis of requirements for, study of the feasibility of, evaluation of alternatives for, or design and development of a computer program or automated data base for use by EPA or contractors operating EPA programs.

(3) Services that provide EPA personnel access to or use of computer or word processing equipment, software, or related services.

(4) Services that provide EPA personnel access to or use of: Data communications; electronic messaging services or capabilities; electronic bulletin boards, or other forms of electronic information dissemination; electronic record-keeping; or any other automated information services.

(b) *General*. The Contractor shall perform any IRM related work under this contract in accordance with the IRM policies, standards and procedures set forth in this clause and noted below. Upon receipt of a work request (i.e. delivery order or work assignment), the Contractor shall check this listing of directives (see paragraph (d) for electronic access). The applicable directives for performance of the work request are those in effect on the date of issuance of the work request.

(1) IRM Policies, Standards and Procedures. The 2100 Series (2100-2199) of the Agency's Directive System contains the majority of the Agency's IRM policies, standards and procedures.

(2) Groundwater Program IRM Requirement. A contractor performing any work related to collecting Groundwater data; or developing or enhancing data bases containing Groundwater quality data shall comply with EPA Order 7500.1A - Minimum Set of Data Elements for Groundwater.

(3) EPA Computing and Telecommunications Services. The Enterprise Technology Services Division (ETSD) Operational Directives Manual contains procedural information about the operation of the Agency's computing and telecommunications services. Contractors performing work for the Agency's National Computer Center or those who are developing systems which will be operating on the Agency's national platforms must comply with procedures established in the Manual. (This document may be found at: <http://basin.rtpnc.epa.gov:9876/etsd/directives.nsf>.)

(c) Printed Documents. Documents listed in (b)(1) and (b)(2) may be obtained from:

U.S. Environmental Protection Agency
Office of Administration
Facilities Management and Services Division
Distribution Section
Mail Code: 3204
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460
Phone: (202) 260-5797

(d) Electronic Access. Electronic access. A complete listing, including full text, of documents included in the 2100 Series of the Agency's Directive System is maintained on the EPA Public Access Server on the Internet at <http://epa.gov/docs/irmpoli8/>.

4. TECHNICAL QUESTIONS (EP 52.215-110) (APR 1984)

Offerors must submit all technical questions concerning this solicitation in writing to the contract specialist. EPA must receive the questions no later

than 7 calendar days after the date of this solicitation. EPA will answer questions which may affect offers in an amendment to the solicitation. EPA will not reference the source of the questions.

5. OPTION FOR INCREASED QUANTITY--FIXED-PRICE CONTRACT (EP 52.217-982) (APR 1984)

(a) The Government may increase the quantity of work called for under this contract as follows:

Optional Items	Qty	Unit Price	Delivery Date
0005 Additional Dilute Exhaust Gas Analysis System in accordance with the attached Statement of Work.	1	_____	250 days after exercise of option
0006 Additional Raw Exhaust Gas Analysis System in accordance with the attached Statement of Work.	2 (MAXIMUM)	_____	250 days after exercise of option
0007 Add Sulfur Dioxide Analyzer to Each Analysis System in accordance with the attached Statement of Work.	6 (MAXIMUM)	_____	TBD
0008 Add Engine Exhaust Gas Recirculation (EGR) determination for Raw Engine Exhaust Gas Analytical Systems in accordance with the attached Statement of Work.	4 (MAXIMUM)	_____	TBD
0009 Add Modal Mini-Diluter (MMD) for Raw Engine Exhaust Gas Analytical Systems in accordance with the attached Statement of Work.	4 (MAXIMUM)	_____	TBD
0010 Add Gaseous Sample Source Switching for Raw Engine Exhaust Gas Analytical Systems in accordance with the attached Statement of Work.	4 (MAXIMUM)	_____	TBD
0011 Additional Particulate Matter, Secondary Dilution and Sampling System in accordance with the attached Statement of Work.	3 (MAXIMUM)	_____	250 days after exercise of option

0012	Extended Warranty for 2 nd Year after Acceptance Date in accordance with the attached Statement of Work.	1	_____	TBD
0013	Extended Warranty for 3 rd Year after Acceptance Date in accordance with the attached Statement of Work.	1	_____	TBD
0014	Extended Warranty for 4 th Year after Acceptance Date in accordance with the attached Statement of Work.	1	_____	TBD
0015	Extended Warranty for 5 th Year after Acceptance Date in accordance with the attached Statement of Work.	1	_____	TBD

(b) The Contracting Officer may exercise an option by written notice to the Contractor within the following time periods:

Optional Items	Time Period for Exercising Option
0005	Within 12 Months After Contract Award.
0006	Within 12 Months After Contract Award.
0007	Within 12 Months After Contract Award.
0008	Within 12 Months After Contract Award.
0009	Within 12 Months After Contract Award.
0010	Within 12 Months After Contract Award.
0011	Within 12 Months After Contract Award.
0012	Within 60 Days of Expiration of the Warranty Period.
0013	Within 60 Days of Expiration of the Previous Year's Extended Warranty Period.
0014	Within 60 Days of Expiration of the Previous Year's Extended Warranty Period.

0015

Within 60 Days of Expiration of the Previous
Year's Extended Warranty Period.

6. CONTRACT ADMINISTRATION REPRESENTATIVES (EP 52.242-100) (AUG 1984)

Project Officer(s) for this contract:

Project Officer:

TO BE IDENTIFIED AT TIME OF CONTRACT AWARD

Contract Specialist(s) responsible for administering this contract:

Administrative Contracting Officer:

TO BE IDENTIFIED AT TIME OF CONTRACT AWARD

ATTACHMENT 2

STATEMENT OF WORK

Statement of Work

Engine Emissions Sampling and Analytical Systems for EPA NVFEL

**Requirements, Functional Specifications,
Performance Criteria, and Acceptance Tests**

**U. S. Environmental Protection Agency
National Vehicle and Fuel Emissions Laboratory**

**2565 Plymouth Road
Ann Arbor, Michigan 48105**

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1.0 Overview and General Requirements

This section provides an overview of the scope of the project and general requirements of the equipment being procured. Specific references, which provide important technical information or guidance, are listed in Section 1.1. Where noted, the requirements of some documents are incorporated by reference as requirements of this Statement of Work. Background information is presented in Section 1.2. A general description of the equipment covered by this Statement of Work, and associated requirements, is presented in Section 1.3. Other general requirements are covered in the balance of Section 1, including requirements for project management.

Contract deliverables and specific requirements are addressed in detail in subsequent sections of the Statement of Work.

Definitions of the acronyms used in this document are provided in the Appendix A.

1.1 References

- 1.1.1 Code of Federal Regulations 40 CFR, Subchapter C, Part 86 “Control of Emissions From New and In-Use Highway Vehicles and Engines,” Subparts B, M, N, R, S
- 1.1.2 Code of Federal Regulations 40 CFR 86.1310-2007, "2007 Heavy-Duty On-Highway Emissions Standards"
- 1.1.3 Code of Federal Regulations 29 CFR Part 1910 “Occupational Safety and Health Standards”

All CFR materials may be found at <http://www.access.gpo.gov/ecfr/>

- 1.1.4 ISO DIS 17025 - General Requirements for the Competence of Testing and Calibration Laboratories www.labcompliance.com/quality-standards/iso17025/ or www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=30239
 - 1.1.5 NFPA 70, National Electrical Code (www.nfpa.org)
- All references shall be the most current available as of the date of this contract.

- 1.1.6 EPA Facilities Manual dated February, 1998
Volume 1 (A/E & Planning Guidelines) and
Volume 4 (4844 - Facility Safety, Health and Environmental Management Manual)
- 1.1.7 EPA Request for Proposal “Test Cell Controllers and Engine Dynamometers for
EPA/NVFEL” (PR-CI-03-10779)

<http://www.epa.gov/oamcinc1/0310779/coverpg.htm>
- 1.18 EPA Request for Proposal “Exhaust Emissions Sampling System (CVS) for Heavy Duty
Engine Dynamometer Test Cell 2” (PR-CI-03-10163)

<http://www.epa.gov/oamcinc1/0310163/coverpg.htm>
- 1.19 SAE Paper 2002-01-0046, “Advanced Emissions Test Site for Confident Pzev
Measurements”

http://www.sae.org/servlets/productDetail?PROD_TYP=PAPER&PROD_CD=2002-01-0046

1.2 Background and Procurement Overview

- 1.2.1 As part of the Clean Air Act and its Amendments, a variety of new emissions regulations have been implemented for new diesel engines. Tier 2, NMOG, ULEV, Supplemental FTP and the Heavy Duty Engine 2007 Rule will require test systems that are integrated as sophisticated and adaptable emission measurement systems. The EPA NVFEL has undertaken a comprehensive program to implement new and refined test systems to enhance the capabilities to conduct low level gaseous and particulate emissions testing, of the highest precision and accuracy, on a broad range of engines.

This Statement of Work describes the equipment and functional requirements for measurement systems that will be required for implementing some of these enhanced capabilities. The equipment implementations described in this document include:

- A complete gaseous and particulate measurement system for a new heavy duty engine test cell - HD Cell 5, located in rooms 423/425 at NVFEL.
- An upgrade and enhancement to the existing systems in Heavy Duty Cell 2 in room 415 to enhance testing capabilities.
- Options to purchase additional raw exhaust analysis systems, and particulate sampling upgrades to other existing engine test cells.

These measurement systems shall be used to evaluate both regulated emissions and currently unregulated emissions from spark ignition and diesel engines operating in a variety of ambient conditions and on a variety of fuels including those currently considered as "alternative". This specification addresses requirements to optimize the measurement of emissions at levels associated with 2007 emission standards.

1.2.2 All general requirements listed in this Statement of Work apply to all equipment purchased under this contract.

1.2.3 Reserved

1.2.4 For the equipment specified, the contractor shall have total system responsibility, which shall include all phases of the project, design/configuration, assembly, integration, quality assurance, delivery to EPA-NVFEL, installation, calibration, commissioning, acceptance testing, documentation and training of EPA staff. The contractor shall be responsible for documenting measurement traceability and system acceptance in a manner suitable for audit to ISO standards.

1.2.5 Items marked as [Enhancement] represent desirable features that EPA would like to have in the delivered systems, but are considered to exceed minimum requirements.

1.3 General Description of Test Sites and Measurement System Requirements

1.3.1 Heavy Duty Engine Test Cell 5 Site Overview

A complete new sampling and analytical system will be installed in EPA's heavy duty test cell 5 (HD5), in rooms 423 and 425 at NVFEL. The emissions sampling system shall be based on a constant volume sampler (CVS), as defined in 40 CFR 86.1310-2007. The gas analysis systems shall include both bag/continuous-dilute and raw emission measurement capabilities. The scope of activity in this procurement is to fabricate, deliver, install, integrate, commission and perform acceptance testing of the exhaust emissions sampling system. This capability is needed in order to test low-emission heavy-duty engines equipped with advanced exhaust emission control systems, in accordance with regulatory requirements. This capability will also be used to support transient and steady state emissions testing of heavy duty engines that is of a more experimental nature.

HD 5 is a newly developed engine dynamometer test cell. The engines that will be tested will typically be used in on-highway truck applications, or non-road applications such as

agricultural equipment. The engines tested in this test cell will typically have rated power values from 100 to 400 HP. The measurement system purchased under this contract shall support all Federal and European heavy duty certification procedures and shall be able to run other configurable procedures for research purposes.

This test site will have a structural mezzanine above the room ceiling panels that is capable of supporting test equipment and dynamometer power drives. The site will house a nominal 600 horsepower AC flux vectored single-ended dynamometer and test cell controller/data acquisition system provided under separate contract. Dynamometer and site controller interface requirements are outlined in Appendices to this Statement of Work to provide additional information.

The core requirement of this Engine Sampling and Emission Systems contract shall be to configure, build and implement a complete sampling and measurement system for this test site that is integrated with the test cell controller and data analysis process. The provided system shall include:

- CFV-CVS with configurable flows up to 5000 CFM
- Particulate tunnel and particulate sampling apparatus, optimized for low level PM analysis
- Raw exhaust and dilute exhaust measurement systems as described in later sections of this Statement of Work.
- All necessary data processors and peripheral equipment required for proper control and functioning of the system

1.3.2 Heavy Duty Engine Test Cell 2 Site Overview

This test site will utilize a new 750 Hp AC flux vectored engine dynamometer, a CVS, and a test cell control and data acquisition system. The contractor shall provide an analysis system to facilitate the measurement of the raw engine emissions. This site shall be used to test engines built to comply with the 2007 standards, as well as various experimental purposes. For both HD 2 and HD 5, the dynamometers and test cell controllers are being provided by Schenck Pegasus Corporation under EPA Contract PR-CI-03-10779 (68-C-03-133), and will be essentially the same for both cells except for dynamometer size. For HD 2, the CVS/tunnel are being provided by AVL North America under EPA contract PR-CI-03-10163 (68-C-03-101). For more information regarding this system see “Exhaust Emissions Sampling System (CVS) for Heavy Duty Engine Dynamometer Test Cell 2” as referenced in Section 1.18. In addition HD 2 utilizes Horiba MEXA 7000 series analyzers for dilute continuous and bag sample measurements.

For HD 2, the core requirement of this contract shall be to configure, build and implement:

- A raw exhaust analysis system.
- All necessary data processors and peripheral equipment required for proper control and functioning of this equipment.

For the HD 2 and HD 5 test cell controllers, Schenck Pegasus is required to integrate and control the operation of the sampling and analytical systems and collect all data directly related to processing an emissions test. These cell controllers are to provide a clear, simple and logical user interface. They will perform associated quality control of the testing process and provide rigorous documentation associated with quality control and traceability. They will provide automation of most tasks associated with testing and support activities. They will provide for preliminary processing, reporting and file transfer of test data, and provide a range of flexible data analysis tools to support special investigations and trouble shooting.

For the HD 2 and HD 5, the contractor supplying measurement systems under this contract shall provide the means and communication protocols for the sampling and analyzer systems to be integrated with the test cell controllers. The sampling and analysis systems shall be capable of carrying out basic time of test functions initiated by the test cell controller computer system to be provided by Schenck Pegasus. Further information related to the Schenck Pegasus contract and the requirements for the test cell controllers may be found at the web site referenced in Section 1.1.7.

A block diagram showing the desired EPA test site and EPA Laboratory Network System (LNS) architecture is shown in Figure 1.

1.3.3 Test Site Descriptions Related to Certain Option Item

Additional information related to EPA test sites associated with certain optional equipment to be offered as part of this contract may be found in Appendix C.

1.4 Safety, Health, and Environmental Provisions

- 1.4.1 Providing for a safe working environment is the highest priority in all EPA equipment purchases and installation activity. The contractor shall abide and comply with all building and safety codes specified by ASME, AISC, NEC, OSHA, BOCA, and NFPA wherever they might apply, to create an intrinsically safe system and work environment.
- 1.4.2 Significant risk factors such as noise, ventilation of toxic gases, heated surfaces, electrical shock, and safety interlocks to prevent accidental errors shall be considered, and control

measures to ensure the safety of operations and maintenance personnel shall be implemented wherever feasible.

- 1.4.3 As required by OSHA, all equipment shall be designed to provide for straightforward lockout protection in accordance with OSHA regulations. Written lockout instructions, in hard copy and electronic formats, shall be provided as part of the “as installed” documentation package.
- 1.4.4 Noise or vibration from equipment installed as part of this contract shall not penetrate the building or cause adverse affects on other equipment in the facility. Sound dampening/suppression devices and/or materials shall be installed as needed to limit noise levels to 60db at 10 feet from any devices to be located in the control rooms, 70db at 10 feet from any devices to be located in the equipment rooms 75db at 10 feet for devices located in the test cells, excepta as otherwise noted.
- 1.4.5 The contractor shall consider energy efficiency in all component selection, system design and operational strategies. Energy efficient equipment, such as those with the “Energy Star” designation shall be utilized when possible.
- 1.4.6 The contractor shall takes steps to minimize the generation and release of harmful materials to the environment in all component selection, system design, and operational strategies and installation requirements.
- 1.4.7 Certain conditions in the test cell operation at large may require that the emissions sampler be shut down quickly. Controls shall be designed to allow a fast shutdown of the blowers from a dedicated digital input signal supplied from an external source.
- 1.4.8 The contractor shall provide the NVFEL Project Officer with a complete list of chemicals to be utilized during installation and commissioning operations at NVFEL, and their associated Material Safety Data Sheets (MSDS), at least four weeks prior to system installation.
- 1.4.9 Installation work shall be performed by appropriately licensed contractors.

1.5 Quality Provisions

- 1.5.1 As part of this contract, the EPA is seeking to purchase measurement systems that will produce data of highest precision and accuracy with a high level of certainty, in a manner that can be comprehensively demonstrated and documented. All equipment and all functions performed by measurement systems must be in accordance with the exhaust

emissions testing and fuel economy-testing requirements of the Code of Federal Regulations and all other codes, standards, practices, etc. included by reference therein or elsewhere in this document.

- 1.5.2 The contractor shall carefully consider all requirements referenced in this Statement of Work, and all other documents incorporated by reference. The contractor shall design a complete and efficient quality strategy for ensuring that all systems delivered as part of this contract meet those requirements and will continue to meet them on an on-going basis. This strategy is expected to include automated pre-test and post-test checks, diagnostic checks, real-time condition monitoring and exception reporting, routine maintenance activities, mistake-proofing and full documentation of NIST traceability where applicable.
- 1.5.3 All documentation and system instructional, alarm and warning messages shall be delivered in a clear, concise manner, in plain English, with a minimum of technical jargon.
- 1.5.4 Systems delivered under this contract are expected to support compliance ISO 17025 - "General Requirements for the Competence of Testing and Calibration Laboratories."
- 1.5.5 [Enhancement] The contractor shall provide computer based tools which monitor and track long term performance of key instrument operating parameter such as response, flow, temperature drift, etc., to provide early warning of failure or significant change in operating performance.
- 1.5.6 The contractor shall deliver systems which provide for automated archiving of active as well as previous, or inactive calibration and verification data for all provided instrumentation.
- 1.5.7 The contractor shall provide systems for computer assisted verification and calibration of all analog signal conditioning hardware delivered as part of this contract.
- 1.5.8 Within the context of this Statement of Work the word "calibration" shall mean:

Calibration - set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or reference material, and the corresponding values realized by standards. (International Vocabulary of Basic and General Terms in Metrology (VIM; 1993) definition). Furthermore, "calibration" shall mean a defined set of actions which produce a permanent record of the relation of instrument response to standards.

Calibration shall not refer to the routine adjustment of instrument offset and gain through the use of "zero and span" materials.

- 1.5.9 The delivered systems shall not update any calibration data or other constants that affect emission results without first explicitly verifying via a dialog box that the action should occur. Any exceptions to valid calibrations shall be displayed, archived, and printed. If the update is affirmed, the update shall be implemented immediately without having to reload any portion of the system or take other further action of any kind. The update verification dialog box shall prompt for an operator ID and provide for operator comments, if any. These updates shall be permanently and centrally documented in an electronic file which stores the old information and new information as part of a clear audit trail. The update documentation file shall be readily accessible, printable, achievable, and copyable, and shall provide for additional comments, which may be added at any time at the appropriate level of password protection.
- 1.5.10 [Enhancement] The update function as described in 1.5.9 shall be available both “real-time,” such as immediately following a calibration procedure, or at a later time, and shall include the option for additional control through the use of a special entry code. Activation of the access code option shall only restrict actual change implementation. Changes may be stored as “pending” for later implementation. All pending changes shall be easily retrievable for later authorization via a screen-viewable and printable listing. Only one calibration for any device and range shall be allowed to be “pending” at one time.
- 1.5.11 At a minimum, each record in the documentation file shall include a unique serial number, a clear description of the action taken, with change time and date, the resulting data change, operator ID, comments, and verification code (if any).

1.6 Operational Efficiency

- 1.6.1 The EPA seeks to maximize value in all its testing operations, and expects the measurement systems delivered as part of this contract to demonstrate a high level of efficiency. The contractor shall consider operational efficiency in all aspects of the design and functioning of these measurement systems. As a simple example, during an automated protocol for CVS verification, it is expected that the system would automatically zero and span the hydrocarbon analyzer while simultaneously acquiring samples, thus internalizing one operation to another and minimizing the total time required for the entire operation. Other examples would be to provide for unattended operation of certain lengthy procedures such as gas analyzer calibrations or computer system back-ups.
- 1.6.2 The equipment shall be designed and configured to function satisfactorily for extended periods on a continuous basis, except for scheduled maintenance. Scheduled maintenance should be minimized.
- 1.6.3 The measurement system shall be designed and configured to facilitate safe, one-person test operation.

- 1.6.4 All components of the systems specified in this contract must be free of any date-based obsolescence (e.g. “Y2K”) problem that would impair operational efficiency or veracity through the year 2050.

1.7 Electrical Requirements

- 1.7.1 Reserved

- 1.7.2 The EPA will provide the following 3 types of power panels, as required, within 50 feet of the point of use for the systems delivered under this contract. Motor and other noisy loads will not be allowed on the clean power grid.

208V/120V, 1 phase, 60 Hz, utility grade power
480V/277V, 3 phase, 60 Hz, utility grade power
208V/120V, 1 phase, 60 Hz, clean power

- 1.7.3 All equipment shall be installed in accordance with the 2002 edition of NFPA 70, National Electrical Code and required local codes.
- 1.7.4 Equipment design and installation shall permit operation in compliance with Occupational Safety & Health Administration (OSHA) Standards Part Number 1910. Electrical equipment shall comply with Part 1910 Subpart S.
- 1.7.5 Equipment design and installation shall be in compliance with 2000 edition of NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.
- 1.7.6 Equipment design and installation shall provide energy-isolating devices required for equipment operators to follow the OSHA rule on the Control of Hazardous Energy (Lockout/Tagout) of Title 29 of the Code of Federal Regulations (29 CFR) Part 1910.147.
- 1.7.7 All electrical cables shall be isolated from gas lines. All equipment installed in the test cell must meet the explosion-proof requirement of Class 1, Division 2, and Group D category. Flammable gas or vapor may be present in the test cell. Equipment installed on the mezzanine level does not have to meet the explosion-proof requirement.
- 1.7.8 The contractor is responsible for providing and installation of all power circuits disconnects, transformers, circuit protection devices, and associated hardware required to interface with EPA provided power panels of paragraph 1.7.2.
- 1.7.9 All power receptacles shall be heavy duty, industrial grade.

- 1.7.10 Clean/uninterruptible power outlets shall be clearly marked and in a color selected by the project officer.
- 1.7.11 Clean/uninterruptible power outlets shall be isolated from utility grade power systems and installed in accordance with the principles of IEEE Std 1100.

- 1.7.12 All cables external to equipment cabinets with voltages over 50V (AC or DC) shall be run in metal conduit or other EPA approved raceway.
- 1.7.13 Control and signal cables shall be isolated from power cables. All signal cabling shall not be adversely affected due to capacitive or inductive interference.
- 1.7.14 All Control and signal cables/wires shall be permanently labeled with to/from and signal/function name information that corresponds with the provided electrical schematic.
- 1.7.15 All crimp or compression type connections shall use only the component manufacturer's approved crimp tools and shall follow the component manufacturer's termination instructions.
- 1.7.16 Discrete digital input/output (I/O) channels shall be 0 to 5 volt TTL level (unless required to be otherwise) and shall be optically isolated from their source.
- 1.7.17 Digital I/O communications channels shall conform to recognized industry standards such as IEEE 802, RS232, RS485, IEEE 488, IEEE 1394, or USB.
- 1.7.18 Analog I/O shall support both ± 5 VDC and ± 10 VDC and thermocouple inputs, with appropriate signal conditioning and isolation.
- 1.7.19 The contractor shall provide complete electrical schematics and wire lists in their final documentation package.
- 1.7.20 All electrical installations shall be performed by a licensed electrician.

1.8 Project Management and Schedule of Deliverables

- 1.8.1 The contractor shall comprehensively manage the project to ensure on-time completion and efficient interaction with EPA during all phases of the project. The contractor shall develop a preliminary project plan for review with EPA at a project kick off meeting. The Project Management plan shall indicate the contractor's project manager, key personnel and contact information, the project time line, and sample formats for meeting minutes, progress reports and open issue tracking. Based on the outcome of the Project Kickoff meeting, the contractor shall deliver a complete project management plan as indicated on the Schedule of Deliverables for this contract.
- 1.8.2 The project management plan should also include the submissions, milestones and events to be completed no later than the dates indicated on the Schedule of Deliverables. Alternate dates for intermediate milestones may be proposed at the Project Kickoff meeting as long

as the end date of the contract is not affected. All modifications to the project schedule must be approved, in writing, by the EPA Project Officer.

- 1.8.3 Full measurement system acceptability shall be demonstrated during the off-site acceptance process. Equipment shipment to EPA shall not occur until this requirement is met. The contractor shall have responsibility for preparing a report thoroughly documenting all quality assurance activities and acceptance results.
- 1.8.4 The contractor shall provide on-site supervision of all installation, commissioning and acceptance activities. All contractor personnel shall receive 1-hour briefing by EPA personnel on specific safety and security issues. All contractor personnel and subcontractor personnel must comply with EPA/NVFEL safety and security measures while working at NVFEL.

2.0 Heavy Duty Engine Test Cell 5 Measurement System Requirements

2.1 Measurement System Layout and Configuration

2.1.1 The emissions sampler for this cell shall nominally be comprised of several major subsystems including:

- (a) Primary dilution tunnel and CVS, including primary dilution air flow measurement
- (b) Particulate matter sampling with secondary dilution
- (c) Raw and dilute gaseous dilute exhaust sample collection
- (d) Raw and dilute gaseous sample analysis

The layout of these major systems is expected to be similar to designs used by EPA in other existing test cells. The layout of the system shall utilize two levels - the test cell floor level and a structural mezzanine above the test cell. The primary dilution tunnel will be placed in the test cell for close proximity to the test engine. The end of the dilution tunnel will pass through a wall into an equipment room where the sample zone will be located. The mezzanine level will house the dilution air processing and dilute exhaust processing portions of the system.

The equipment shall be designed to fit into the space that is available. The room sizes are as follows:

Test cell:	20' width, ceiling 10' high
Equipment room:	12.5' width (5' useable at wall), ceiling 10' high
Mezzanine@147":	33' by 15' area above the test cell and equipment room, 93" clear to the 20' building steel. There is an additional 4' girder space in the building steel area, which may have some useable space for conduits. Much of it has ducts, conduits and pipes. Some access is available in the open web joist space below the bar grate decking of the mezzanine.

Figure 2 has been included to illustrate the available spaces, and provide an example equipment layout.

2.2 Sampling/Analysis Data System Functions

2.2.1 For the base systems purchased under this contract, the dynamometers and test cell control and data acquisition systems have been purchased under separate contract, which has been awarded to Schenck Pegasus Corporation. The reference for the statement of work related to that contract may be found in Section 1.17. Schenck Pegasus will have the

primary responsibility for integrating the systems provided by this “Engine Emissions Sampling and Analysis Systems” contract. However, the contractor awarded the “Engine Emissions Sampling and Analysis Systems” contract shall have the responsibility to work cooperatively in this effort and provide all required information and integration support to assure all equipment control functions are carried out properly and all data directly related to processing an emissions test is collected. In large part, all function commands and data communication shall be by TCPIP. Minor exceptions to this will be allowed for certain limited and specialized functions.

- 2.2.2 The computer interface(s) for equipment purchased under this “Engine Emissions Sampling and Analysis Systems” contract shall be designed such that personnel without specialized computer experience will be able to operate the control system and the peripheral units, including the input of parameter changes, with minimal basic system training.
- 2.2.3 The data systems supplied for equipment purchased under this contract shall be capable of acquiring and transferring data at a minimum of 10 Hz to the test cell controller and data acquisition system via TCPIP protocol. Specific frequencies to acquire and transfer acquired data shall be user configurable. Acquired data shall include high accuracy clock time-stamps sufficient for time alignment of values.
- 2.2.4 The construction and functioning of the sampling and analytical systems shall facilitate diagnostic checks and highly precise and accurate calibrations. The computer systems(s) for equipment purchased under this contract shall guide and automate routine calibration functions. The following list contains examples of these types of functions.
 - (a) Gas Analyzer Calibration with Automatic Span and Mid-Range Checking of the Candidate Curve
 - (b) Pressure Transducer Calibration/Verification
 - (c) Temperature Channel Calibration /Verification
 - (d) Auxiliary Channel Calibration/Verification
 - (e) NO_x Eff check
 - (f) NO_x Quench Check
 - (g) CVS Verification by propane injection (both gravimetric cylinder and CFO methods)
 - (h) [Enhancement] Auxiliary Sampler/CVS Verifications
This test will be conducted in a manner similar to a conventional CVS verification per the description found in Section 2.3.45.
 - (i) CO₂ and water interference check of CO analyzers
 - (j) Determination of Methane Response of Total Hydrocarbon Analyzer
 - (k) Determination of Generalized HC Species Response of Total Hydrocarbon Analyzer (Single Component). This is expected to be performed in a manner equivalent to the methane response determination.
 - (l) Determination of Oxygen Correction of Total Hydrocarbon Analyzer Response
 - (m) Verification/Calibration functions for all system flow-measurement devices

- (n) Instrument zero/span adjust, including zero/span alignment algorithms
- (o) Instrument zero/span verify, to include comparison of instrument-zero/span and overflow zero/span for the heated sample probes
- (p) Sample path leak check routines
- (q) Bag evac only
- (r) Bag evac-purge-evac
- (s) Sample bag leak check
- (t) External bag sample read (through remote bag port)
- (u) Dilution air sample read

2.2.5 The sampling and analytical systems shall provide for engine test procedures which include test configuration options as follows:

- (a) Raw exhaust sampling
- (b) CVS bag sampling, continuous dilute sampling or both
- (c) Particulate Matter sampling

The system shall account and adjust for the raw exhaust sample being removed from the tunnel.

2.2.6 The systems shall measure and transfer all sampling and analytical system parameters required for the complete calculation of the final mass emission results.

2.2.7 The sample system/bag leak checking process shall be a separate, stand-alone function and shall not be automatically performed for each test. This system shall be configured to evac-purge-evac-leak check all sample bags in less than ten minutes. These functions shall be fully automated and include user selection for checking each bag singularly and in any combination. The purge/evac/leak check process and criteria shall be definable and changeable.

The leak check shall be based on vacuum decay of individual sample bags, utilizing high-resolution transducers. The starting vacuum shall nominally be 20 inHg. The bag leak check shall be considered to be acceptable if the observed vacuum decay is less than 2 inHg in 1 minute and is stable. Other methods of equivalent stringency will be considered.

2.2.8 The sampling and analytical data system(s) shall monitor critical operating parameters during an automated process to ensure the integrity and quality of the process. These parameters shall be monitored against easily configurable and modifiable alarm tables specific to the operation being performed. The CVS, sampling, and analytical systems shall be configured to interface to the test cell control and data acquisition in such as way as to transfer associated warning or alarm messages to that system.

- 2.2.9 A detailed specification of run time monitoring quality control functions shall be submitted to EPA for approval as described in the Project Management Section of this Statement of Work.
- 2.2.10 All automated calibration and diagnostic functions shall include an option to produce a summary report.
- 2.2.11 For all reports, pertinent header information shall be presented on each page, sufficient to uniquely identify that each page is part of the same test report. All pages, of all reports, related to specific engine tests shall contain the EPA test number for that test and shall be labeled with the current page number and the total number of pages. All report layout and content shall be approved by the EPA Project Officer, as indicated in the Project Management Requirements.
- 2.2.12 All reports and computer records produced to document measurement instrument calibration/verification shall minimally contain the following information:
- Name of Operation, Pertinent references
 - Date, Time, Operator
 - EPA Test Site Designation
 - Identification of devices and standards utilized
 - Data related to pertinent conditions, such as pressure, temperature, humidity
 - All data directly related to the operation conducted
 - Summarized data related to outcome such as coefficients, offsets, efficiencies, both “as found” and “as calibrated,” where applicable
 - Other pertinent statistics to indicate quality of outcome such as regressions statistics and other summary statistics
 - Text-type notes and observations
 - Pass/Fail indications and Accept or Reject indications, where applicable
 - Units identified for all data

2.3 CVS Sampling System and Dilution Tunnel

The dilution tunnel shall be designed to minimize particulate loss due to impaction and thermophoresis. The tunnel sampling section shall include multiple sample ports or flanges for attaching auxiliary sample collection systems. EPA’s principle particulate dilution tunnel design goals are:

- Temperature control via dilution, not heat loss through tunnel walls (primary and secondary tunnels)
- Minimize thermal mass of tunnel
- Minimize raw exhaust transfer

- Rapid and complete mixing in as short as possible length
- Heated particulate probes
- Packaging to suit space and ease of operation

- 2.3.1 The contractor shall provide a CVS system, exhaust tunnel and related devices that meet the requirements of 40 CFR Part 86 and additional and specific requirements outlined below. The contractor shall configure a system that meets these requirements in a manner that will provide adaptability for future needs. The overall sampling system shall facilitate potential future expansion, adaptation, and enhancement of exhaust sampling and analysis capabilities such as real-time FTIR measurements or real-time particulate measurements.
- 2.3.2 The CVS system shall allow for a range of user selectable total bulk stream flows via a system of selectable critical flow venturi and shall provide for direct measurement of dilution air. The diluted exhaust gas shall be measured by the CVS utilizing one fixed 2000 scfm CFV and two selectable CFVs at one 1000, and one 2000 scfm (68 degF and 760 mm Hg) flow rates. All four combinations of flows, from 2000 to 5000 scfm, shall be available through simple set-up procedures.
- 2.3.3 Each venturi shall be removable by one person for cleaning or replacement with an alternate size in less than 60 minutes. The inlet coupling shall provide a reliable leak free connector. The contractor shall provide a straight forward procedure to verify the absence of leaks in the selection valves and couplers.
- 2.3.4 The bulk stream critical venturi inlet surfaces shall be toroidally shaped and finished in accordance with the latest accepted engineering practices (i.e. ASME, ANSI) for dynamic fluid meters. The temperature at the inlet section may range from 15-191 degC.
- 2.3.5 The bulk stream venturi shall receive a NIST traceable calibration with an uncertainty of $\pm 0.5\%$ or less, prior to acceptance. The C1 value shall be calculated and reported in the associated calibration report. The critical flow rate shall be obtained when 4 inches of mercury vacuum or higher is applied to the outlet of the venturi. The input of new C1 values in the CVS controller shall be simple and straightforward, but only available at the maintenance/engineering level of password protection.
- 2.3.6 Static pressure at the venturi inlet shall be measured using an absolute pressure transducer. This transducer shall have nominal range of 0-15 PSIA, with a 50% over-ranging capacity. This transducer shall utilize a temperature compensated and shunt calibration measurement technique. The static error shall be less than $\pm 0.2\%$ of full scale or better.
- 2.3.7 The venturi inlet temperature probe shall be accurate to $\pm 0.2\%$, and shall meet the 100 ms response time (as measured in hot flowing oil) required by the CFR test regulations. The contractor shall certify this response and accuracy. Pressure and temperature sensors shall meet the requirements of 40 CFR 86.1310-2007.

2.3.8 The CVS system shall monitor for non-choke or abnormal flow in the main CFV or in the sample CFV system and issue an appropriate warning if non-choke flow is detected. Choke flow monitoring shall be in accordance with 40 CFR 86.119-90, as amended by publication in the Federal Register February 18, 2000 and restated here.

(8) *Calculation of a parameter for monitoring sonic flow in the CFV during exhaust emissions tests:*

(I) *Option 1.*

(A) *CFV pressure ratio. Based upon the calibration data selected to meet the criteria for paragraphs (d)(7) (iv) and (v) of this section, in which kV is constant, select the data values associated with the calibration point with the lowest absolute venturi inlet pressure. With this set of calibration data, calculate the following CFV pressure ratio limit, Pr ratio-lim:*

$$Pr \text{ ratio-lim} = P_{out-cal}/P_{in-cal}$$

Where:

*P_{in-cal} = Venturi inlet pressure (PPI in absolute pressure units), and
 $P_{out-cal}$ = Venturi outlet pressure (PPO in absolute pressure units),
measured at the exit of the venturi diffuser outlet.*

(B) *The venturi pressure ratio (Pr ratio-I) during all emissions tests must be less than, or equal to, the calibration pressure ratio limit (Pr ratio-lim) derived from the CFV calibration data, such that:*

$$P_{out-i}/P_{in-I} = Pr \text{ ratio-I} \text{ must be less than or equal to } Pr \text{ ratio-lim}$$

Where:

P_{in-I} and P_{out-I} are the venturi inlet and outlet pressures, in absolute pressure units, at each I -th interval during the emissions test.

(ii) *Option 2.*

Other methods: With prior Administrator approval, other methods may be used that assure that the venturi operates at sonic conditions during emissions tests, provided the method is based upon sound engineering principles.

2.3.9 The CVS controller shall operate on 120 VAC connected from a single facility connection. If any required current exceeds 30 amps, that part of the system shall operate on 480 VAC, 3 phase. The wiring installed with the dilution air system, the sampling system control and the blower shall have three conductors for 120 VAC (or four conductors including earth ground) and three power lines for 480 VAC. The power distribution panel shall have interlocking manual circuit breakers and overload protection.

- 2.3.10 All measurement equipment shall use instrument quality power from a separate clean power circuit that will be provided by EPA. Pumps, ovens, heated lines, blowers and other non-critical electrical devices shall use normal utility power. Equipment to be connected to these power sources shall be isolated from each other in a manner that eliminates any interference or induced noise or voltage spikes.
- 2.3.11 The CVS blower(s) shall be located on the second level mezzanine in a non-obstructive location and the flow shall be exhausted to the building exhaust system. Exact positioning requirements of the CVS blower(s) shall be based on the information provided at the Project Kickoff Meeting. Noise suppression shall be provided for the CVS blower to assure a noise level less than 80 dBA at 5 feet distance.
- 2.3.12 The blower system shall be separate from the sampler unit. The contractor shall supply leak tight flexible ducting between the sampler unit and the blowers and exhaust vent. All connections to outlet ducting shall be by means of removable couplings. A flexible section of tubing shall be provided by the contractor to provide alignment, strain relief, and vibration isolation.
- 2.3.13 The blower inlet/outlet piping shall be sized for pressure drops that assure adequate flow and configured for ease of maintenance, flexibility, and cleaning. The blower impeller shall be designed to handle engine exhaust gas streams and operate so that there is little or no build up of debris on the impeller blades. The blower shall be designed for at least the maximum expected inlet gas temperatures of up to 191 °C.
- 2.3.14 The blower shall be sized and rated to maintain the CFV/CFV's in choke or critical flow with a 20% excess flow capacity at rated suction. The blower motor shall operate on 480 VAC, 60 Hz, 3 phase, "Y". Electrical motors shall be equipped with magnetic starters and have a power factor greater than 0.90 and shall not contribute any EMF, RFI, or ground loop noise or interference.
- 2.3.15 The CVS system shall provide a surge bleed for the blower, as necessary, and shall provide constant monitoring to assure choked flow is maintained. The CVS shall issue an alarm signal upon any blower or blower controller failure. In addition the system shall provide a dry contact closure when the blower is on and functioning properly, for monitoring by other systems.
- 2.3.16 A sampler duct ahead of the CFVs shall provide multiple fittings for cold gaseous sample extraction and bypass return/purge lines as well as the CFV inlet pressure and temperature instrumentation. These fittings shall be fabricated from ½ inch NPT stainless steel pipe bosses. Spare fittings shall be plugged.

2.3.17 The CVS and tunnel system shall meet the static exhaust pressure depression requirements given in 40 CFR 86.1309-90(b)(1). A means for setting engine exhaust restriction prior to entry to the CVS shall be provided. This device shall be adjustable from the control room and conveniently located adjacent to an exhaust back pressure display. The restrictor shall be designed in such a way that the restriction is fixed until explicitly changed, and will remain unchanged during loss of building power or compressed air.

2.3.18 [Enhancement] The hardware for exhaust back pressure shall include a display indicating the nominal position of the restrictor.

There is no minimum mixing zone length requirement. Tunnels shall be made as short as possible to the extent that complete mixing is achieved, as defined in 40 CFR 86.1310-2007, under the full range of operating conditions specified in this Statement of Work. A formal report fully detailing the adequacy of mixing in the tunnel upstream of the sample zone shall be provided by the contractor to EPA in advance of final acceptance testing.

Primary CVS Dilution Air

2.3.19 The CVS system shall provide means for filtering dilution air and continuously measuring the temperature and humidity of the filtered dilution air. In addition, the CVS system shall continuously measure, record and report dilution air flow.

2.3.20 Dilution air shall be filtered with HEPA filters as follows:

- (a) HEPA filters shall be standard sized units: 24" x 24" x 12"
- (b) Multiple HEPA filters shall be mounted on a plenum assembly for easy removal and replacement.
- (c) HEPA filter design shall have a minimum particle removal efficiency of 99.97% at 0.3 micron
- (d) The pressure drop across all HEPA filters and plenum assembly shall be less than 1" H₂O at 5000 cfm with clean filters.

2.3.21 Dilution air flow shall be measured with a subsonic venturi, by an ultrasonic air flow meter or other means. This flow meter shall measure air flowing from 1000-5000 SCFM at 15-30 deg C. Flow rate measurements shall be accurate to within $\pm 0.5\%$, traceable to NIST. This system shall have fast response and accurate temperature sensors (T90 <300ms) for the measurement of small temperature variations and shall have appropriately responsive pressure transducers to indicate the inlet and differential pressure conditions. Devices such as dampers and flow conditioners shall be used to stabilize the pressure and flow signals, as

required. They shall be designed in a manner that provides an adequate response to track the transient flow changes during the tests.

- 2.3.22 The CVS shall be able to accurately meter and totalize the dilution air flow rate, and the total dilute exhaust flow rate, to determine the total exhaust volume at standard conditions and the dilution factor during and over the course of the emissions test. Both the total dilution air and exhaust mixture standard volumes shall be provided for any test phase.
- 2.3.23 The CVS system shall provide for sample and ambient bag sampling for four independent test phases. Sample bags shall nominally be 100 liters in size and constructed of Tedlar. In addition to the installed sample bags a quantity of eight spare bags shall also be provided.
- 2.3.24 The system shall also provide an easily accessible port for proportionally sampling and filling an “auxiliary” sample and ambient bag in parallel with the system at a varying and selectable rate. If the auxiliary bag is chosen as an option during test set up, a proportional flow sample shall be routed to this port during all sampled portions of the test. These ports shall be fitted with a self-sealing quick connect and may also be utilized for the external bag read function.
- 2.3.25 In addition to the gaseous emissions sampling, the CVS system shall also incorporate dilution tunnels, secondary dilution tunnels, sample preconditioners, filter holders and particulate sample flow controls to measure low level of particulate emissions in accordance with the requirements of 40 CFR 86.1310-2007. The dilution tunnel shall be designed to minimize particulate loss due to impaction and thermophoresis and shall promote uniform dilution and mixing in a minimal length. Temperature control shall be through dilution, and shall not depend on heat transfer through tunnel surfaces. All equipment shall be designed to meet the nominal test cell layout illustrated in Figure 2.

Primary Dilution Tunnel Assembly

- 2.3.26 The primary dilution tunnel shall be constructed of nominal 18” OD tube with a wall thickness of 0.0625” made from 316 stainless steel. All plumbing that comes in contact with dilute exhaust shall be of 316 stainless steel or Teflon tubing construction only. The tube wall shall be as thin as possible to minimize thermal mass and prevent deposition. The tunnel shall be constructed in a sectional configuration that would allow for future modifications. The dilution tunnel shall be electrically grounded over its entire length.
- 2.3.27 The primary dilution tunnel shall nominally consist of the following components designed to fit in the test cell and meeting the specifications described in detail below.

One (1) Mixing Tee
Three (3) Solid Tubing Sections
One (1) Sample Zone

- 2.3.28 The main tunnel shall nominally be constructed of three 52" long sections fitted with bolt style flanges on each end and shall include a non reactive gasket designed into the flange. All flanges shall be leak tight over the temperature range of 15 - 190 deg C. and shall provide a smooth inside surface when they are assembled that will not disrupt the flow pattern inside the tunnel. When the entire tunnel is assembled, all pieces shall have electrically conductive connections either through the mechanical connections of the flanges or by a separate ground strap wiring to each piece. A ground strap shall be provided for connection to the facility ground. All ground strap cable shall be at least 1/2" braided copper ground strap, and shall be a maximum of 50' for connection to a facility ground.
- 2.3.29 Four (4) sample ports shall be installed at 90 degrees around the circumference and this pattern shall be repeated at every 18" increment of tunnel length from the raw exhaust exit to the sample zone. Each port shall be a 1/2" NPT stainless steel pipe boss cut in half and welded to the exterior of the tunnel wall, and drilled out for a 3/8" clearance hole. These ports will be used on an ad-hoc basis, initially to determine the mixing profile of the tunnel and in the future for other experimental purposes. Once installed these ports shall be plugged.
- 2.3.30 The construction of the engine exhaust inlet to the tunnel shall include a means to easily divert flow from the engine directly to the building exhaust scrubber, bypassing the CVS, tunnel and blower. This is required as an energy savings measure to avoid the use of the CVS and blower whenever an engine needs to be run but emissions do not need to be sampled

Sample Zone/Sample Collection

- 2.3.31 Reserved
- 2.3.32 The sample zone shall be the final 60" of primary dilution tunnel length with a discharge that directs the mixture vertically up through the ceiling panels to the CVS flow metering system. Flanges shall be installed to connect this section to the mixing zone portion of the primary tunnel. The sample zone shall be designed for dilute exhaust gas temperatures up to 191 deg C (375 deg F). Temperature shall always be measured and monitored in this section during operation.

Exhaust samples shall be collected from the dilute exhaust gas mixture in the sample zone assembly where the raw exhaust and dilution air are completely mixed. The type of analyses done on samples collected at this point include, but are not limited to continuous hot gaseous sampling (HC, Nox, CH₄), particulate matter sampling, toxics samples, FTIR sampling, and unheated batch collection gaseous samples (HC, NO_x, CO, CO₂, CH₄).

Sample ports for heated gaseous and particulate sample probes shall be provided on the

dilution tunnel. Ports for sample probes shall be located at least 180" from the raw exhaust dilution point.

The sample zone shall include four sanitary style leak tight ports. Each port shall be 6" in diameter. Each port shall be supplied with a blank plate, clamp and flange. Two (2) of the ports shall be located at the middle of each side of the tunnel at the sample zone, one (1) on each side. The remaining two (2) ports shall be equally spaced 60 degrees below horizontal on the lower half of the tunnel.

- 2.3.33 Sample lines shall be installed from the dilution air supply system and from the dilute exhaust sampling section to the CVS control unit. These lines shall minimize the sample exposure area and transport time and assure the integrity of the sample and shall be of minimum length, preferably not to exceed 25 feet. No sample conditioning which could affect the sample composition shall occur in this section.
- 2.3.34 Ambient and dilute exhaust sample pumps shall be fixed displacement pumps that have the capacity to deliver the required flows and pressures (or vacuums) for the engine test cycle sampling. All parts in contact with the sample gas shall be of stainless steel or Teflon. Mechanical parts shall use HC free lubricants. Sample pumps shall have a pressure relief of 10 PSIG and a solenoid valve dump port for bypass mode to enhance flow characteristics and to prevent condensation.
- 2.3.35 All solenoid valves used in the CVS control unit shall be two-way valves, normally-closed, rated for continuous duty. They shall be of a design that has minimized dead volume and surface exposure to the sample and a pressure drop that prevents condensation of moisture in the sample. Solenoid valves shall be designed and rated for oxygen service, or equivalent.
- 2.3.36 Any exhaust sample filter in the gaseous sampling system shall be made of media that does not produce or absorb gases which would in any way affect the measurement accuracy of any of the devices utilized in the gaseous measurement system described in this Statement of Work. Gas path filters shall provide a visual indicator of condition and easy accessibility for replacement. The filter shall be protected so that its integrity is not effected when the sample pump is turned on or off.
- 2.3.37 Plumbing for the transfer of the dilute exhaust samples shall be primarily of 316 stainless steel, which shall be cleaned and treated for handling ultra low concentrations as necessary. Short lengths of steel braided Teflon tubing may be used on pump inlets and outlets for vibration isolation. The sampling system shall have all sample and transport lines sized for minimal surface exposure, minimal dead or dilution volumes, optimal transport time and minimal pressure drop. These lines shall be protected from cuts or leaks, and shall have stainless steel tube fittings. Automatic leak check capabilities shall be provided. Quick disconnect fittings shall be thermocouple grade and seals shall be made of HC free

materials.

- 2.3.38 All sample flow rates shall be maintained as continuously proportional to the main bulk-stream flow, within $\pm 2.0\%$ at all times. This requirement shall be continuously monitored during all testing operations. All flow measurements utilized in this determination shall have an accuracy and repeatability of 0.5%, traceable to NIST.
- 2.3.39 This proportionality constant can be changed from phase to phase, but must be stable throughout the phase. For example, a higher sample flow rate into the sample bag may be needed for short test phases in order to have adequate integrated sample for analysis.

CVS System Additional Requirements

- 2.3.40 All major components shall be designed, fabricated and installed in such a manner as to facilitate safe, easy set-up and hook-up to a wide range of engines, by one person.
- 2.3.41 The assembled sampling system shall have the necessary components to isolate the sample tunnel for leak checking. The sample system shall be leak-tight, with a leak rate of less than 10 cfh at 5" H₂O static pressure.
- 2.3.42 The CVS sampling system shall have two modes of control operation local (manual) mode and remote (automated) execution, selectable on the front panel and through the computer interface. The control screen shall clearly provide for display of all pertinent data and measurement parameters and for a flexible and adaptable operator and procedural interface. The test logic and valve selection control shall be programmable from the control computer menus or selection screens, and shall be capable of manual selection or executable as an automated test sequence.
- 2.3.43 The CVS shall provide for local control of the following functions at the front panel. Local control means that the function can be selected and controlled by the operator. This could be done by a button or switch, or a computer interface of a virtual button that can be activated by mouse, touch, or menu selection. This control panel shall include but not be limited to the following functions
- Power On/Off
 - Blower On/Off - CVS main blower
 - Blower On/Off - dilution air control system
 - Local and automatic control mode selection
- 2.3.44 The measurement system shall include a CFO kit with appropriately sized orifices to create a diluted concentration of propane that can be analyzed accurately at all tunnel flow rates. The CFO kit shall provide for direct measurement of orifice temperature via RTD and

digital readout, and measurement of pressure via transducer and digital readout, and 0-10V analog outputs for temperature and pressure for data acquisition.

- 2.3.45 The delivered system shall include all other hardware provisions for automated CVS verification routines per CFR.
- 2.3.46 [Enhancement] In addition to the requirements for CVS verification, the contractor shall make provisions to check concentrations at all sample point locations, including secondary dilution tunnels, under steady state conditions, to demonstrate system integrity. Concentrations shall be compared to the concentration of a sample taken immediately adjacent to the main flow venturi. These samples may be taken sequentially and may involve manual disconnection, movement and reconnecting of a sample line.
- 2.3.46 For calculation of all CVS/sampler verifications made by using a CFO kit utilizing pure propane, the density of pure propane at the CFO shall be assumed to be 52.83 grams/standard (1 atm., 20 deg C) cubic foot for injected mass calculations. The density of diluted propane withdrawn from a sample system shall be assumed to be 51.90 grams/standard (1 atm., 20 deg C) cubic foot for CVS mass recovery calculations
- 2.3.47 Two additional 1" NPTF sample ports shall be installed approximate 20" to 30" upstream of the main venturi, for future use. The exact location of these ports will be determined at the time of preliminary design submission.
- 2.3.48 CVS installation shall include attachment of the blower outlet to the existing NVFEL exhaust extraction system. This installation shall include fabrication of an inlet adapter for the CVS blower and two additional 12" (nominal dimension) round ducts to connect to the end of the existing 30" round facility exhaust duct.

2.4 Secondary Dilution and Sampling System for Particulate Matter

- 2.4.1 The contractor shall provide and integrate a multiple, heated probe particulate sampling system as part of the CVS and analytical systems to facilitate a total system that is compliant with the provisions of the 2007 Heavy Duty Engine Rule.

The following is excerpted from 40 CFR 86.1310-2007(b)(6) for convenience:

(6) Particulate sampling system. This method collects a proportional sample from the primary tunnel, and then transfers this sample to a secondary dilution tunnel where the sample is further diluted. The double-diluted sample is then passed through the collection filter. Proportionality (i.e., mass flow ratio) between the primary tunnel flow rate and the sample flow rate must be maintained within +/- 5%, excluding the first 10 seconds of the test at start-up. The requirements for

this system are:

(I) The particulate sample transfer tube shall be configured and installed so that:

(A) The inlet faces upstream in the primary dilution tunnel at a point where the primary dilution air and exhaust are well mixed.

(B) The particulate sample exits on the centerline of the secondary tunnel.

(ii) The entire particulate sample transfer tube shall be:

(A) Sufficiently distant (radially) from other sampling probes (in the primary dilution tunnel) so as to be free from the influence of any wakes or eddies produced by the other probes.

(B) 0.85 cm minimum inside diameter.

©) No longer than 36 in (91 cm) from inlet plane to exit plane.

(D) Designed to minimize the diffusional and thermophoretic deposition of particulate matter during transfer (i.e., sample residence time in the transfer tube should be as short as possible, temperature gradients between the flow stream and the transfer tube wall should be minimized). Double-wall, thin-wall, air-gap insulated, or a controlled heated construction for the transfer tube is recommended.

(E) Constructed such that the surfaces exposed to the sample shall be an electrically conductive material, which does not react with the exhaust components, and this surface shall be electrically grounded so as to minimize electrostatic particulate matter deposition.

(iii) The secondary dilution air shall be at a temperature equal to or greater than 15 deg C.

(iv) The secondary-dilution tunnel shall be constructed such that the surfaces exposed to the sample shall be an electrically conductive material, which does not react with the exhaust components, and this surface shall be electrically grounded so as to minimize electrostatic particulate deposition.

(v) Additional dilution air must be provided so as to maintain a sample temperature of 47 deg C +/- 5 deg. C upstream of the sample filter. Temperature shall be measured with a thermocouple with a 3/16 inch shank, having thermocouple wires with a gage diameter 24 AWG or smaller, a bare-wire butt-welded junction; or other suitable temperature measurement with an equivalent or faster time constant and an accuracy and precision of +/-1.9 deg C.

(vi) The filter holder assembly shall be located within 12.0 in (30.5 cm) of the exit of the secondary dilution tunnel.

(vii) The face velocity through the sample filter shall not exceed 100 cm/s (face velocity is defined as the standard volumetric sample flow rate (i.e. scm³/sec) divided by the sample filter stain area (i.e., cm²)).

(7) Particulate sampling.

(I) Filter specifications.

(A) Polytetrafluoroethylene (PTFE or TeflonTM) coated borosilicate glass fiber high-efficiency filters or polytetrafluoroethylene (PTFE or TeflonTM) high-efficiency membrane filters with an integral support ring of polymethylpentene

(PMP) or equivalent inert material are required. Filters shall have a minimum clean filter efficiency of 99% as measured by the ASTM D2986-95a DOP test (incorporated by reference at Sec. 86.1).

(B) Particulate filters must have a diameter of 46.50 +/-0.6 mm (38 mm minimum stain diameter).

(C) The dilute exhaust is simultaneously sampled by a single high-efficiency filter during the cold-start test and by a second high efficiency filter during the hot-start test.

(D) It is recommended that the filter loading should be maximized consistent with temperature requirements.

(ii) Filter holder assembly. The filter holder assembly shall comply with the specifications set forth for ambient PM measurement in 40 CFR Part 50, Appendix L 7.3.5, figures L-25 and L-26, with the following exceptions:

(A) The material shall be 302, 303, or 304 stainless steel instead of anodized aluminum.

(B) The 2.84 cm diameter entrance to the filter holder may be adapted, using sound engineering judgment and leak-free construction, to an inside diameter no smaller than 0.85 cm, maintaining the 12.5 deg. angle from the inlet of the top filter holder to the area near the sealing surface of the top of the filter cartridge assembly. Figure N07-2 shows acceptable variation from the design in 40 CFR Part 50, Appendix L. Similar variations using sound engineering design are also acceptable provided that they provide even flow distribution across the filter media and a similar leak-free seal with the filter cartridge assembly.

(C) If additional or multiple filter cartridges are stored in a particulate sampler as part of an automatic sequential sampling capability, all such filter cartridges, unless they are installed in the sample flow (with or without flow established) shall be covered or sealed to prevent communication of semi-volatile matter from filter to filter; contamination of the filters before and after sampling; or loss of volatile or semi-volatile particulate matter after sampling.

(iii) Filter cartridge assembly. The filter cartridge assembly shall comply with the specifications set forth for ambient PM measurement in 40 CFR Part 50, Appendix L 7.3.5, figures L-27, L-28, and L-29, with the following exceptions:

(A) In addition to the specified Delrin /TM/ material, 302, 303, or 304 stainless steel, polycarbonate or acrylonitrile/butadiene/styrene (ABS) resin, or a combination of these materials may also be used.

(B) A bevel introduced on the inside diameter of the entrance to the filter cartridge, as used by some commercially available automated sequential particulate filter cartridge changers, is also acceptable (see Figure N07-3).

(iv) Particle preclassifier. A particle preclassifier shall be installed immediately upstream of the filter holder assembly (N07-1). The purpose of the preclassifier is to remove coarse, mechanically generated particles (e.g., rust from the engine exhaust system or carbon sheared from the sampling system walls) from the sample flow stream while allowing combustion-generated particles to pass

through to the filter. The preclassifier may be either an inertial impactor or a cyclonic separator. The preclassifier manufacturer 50% cutpoint particle diameter shall be between 2.5 micron and 10 micron at the volumetric flow rate selected for sampling of particulate matter emissions. Sharpness of cut is not specifically defined, but the preclassifier geometry shall allow at least 99% of the mass concentration of 1 micron particles to pass through the exit of the preclassifier to the filter at the volumetric flow rate selected for sampling particulate matter emissions. Periodic servicing of the preclassifier will be necessary to prevent a buildup of mechanically separated particles. The particle preclassifier may be made integral with the top of the filter holder assembly. The preclassifier may also be made integral with a mixing-tee for introduction of secondary dilution air, thus replacing the secondary dilution tunnel; provided that the preclassifier provides sufficient mixing.

Contractors offering products in response to this RFP, are expected to fully understand the complete statutory requirements for EPA engine emissions testing, and provide products that fully comply with these requirements.

- 2.4.2 The Particulate Matter, Secondary Dilution and Sampling System shall be designed to acquire a configurable quantity of one to three independent samples for up to four separate configurable test phases, without changing out any filters. The system shall nominally consist of:
- A minimum of three separate heated sample probes/sample transfer tubes controlled to a temperature of $375^{\circ}\text{F} \pm 15^{\circ}\text{F}$.
 - Stainless steel cyclonic separators /secondary dilution systems for each probe
 - A quantity of 12 filter holders
 - All associated flow, pressure and temperature measurement, temperature control and valving and flow control for three independent sample paths
 - Microprocessor based system controller supporting data acquisition and TCPIP data transfer to a host computer system provided by Schenk Pegasus. The microprocessor shall support both “local” and “host” modes of operation.
- 2.4.3 The particulate sampling system shall provide sufficient flexibility, temperature control and adjustability to maintain proper filter face temperature and appropriate filter mass loading for a wide range of engines and test conditions. Maximum horsepower and exhaust flow rates shall be utilized in determining heat inputs to the tunnel.
- 2.4.4 Mass of particulate emissions shall be determined from a proportional mass sample collected on a filter, the dilute exhaust sample flow from the main tunnel and total main tunnel flow over the test period.
- 2.4.5 The particulate measurement system shall utilize high efficiency membrane filters as

described below. Due to the high efficiency and relatively high pressure drop across these filters, a backup filter will not routinely be employed. A total of 300 filters shall be delivered with the system.

Nominal filter specification: Pall “Teflo” R2PJ047 - 47mm, or equivalent

- 2.4.6 The particulate sampling system shall provide for the automated, simultaneous, collection of up to three independent, parallel, filter samples for up to four discrete sample phases without changing filter holders during a test. Filter holders shall be attached to the system by means of quick disconnects. In lieu of quick disconnects, other devices that consist of hinges or clamps are acceptable as long as they allow for easy, leak free installation and removal of the filter holder assembly.

For each of the three parallel sample paths, the particulate sampler shall employ separate, independent flow measurement devices for determining the amount of sample withdrawn from the main tunnel. The flow measurement devices shall have a precision and accuracy of 0.5% under all conditions that may be experienced during testing.

- 2.4.7 The sample flow rate for each individual filter shall be controlled, measured, integrated, and reported in standard flow units, so that individual gram per phase, gram per bhp-hr, or grams per minute values may be calculated for each filter. All gas flows shall be corrected to standard conditions. The particulate system shall maintain sample flows in proportion to main tunnel flows, in accordance with CFR requirements. The system shall issue an alarm and appropriate text message if proportionate flow cannot be maintained. The observed sample temperature upstream of the filter holder and vacuum downstream of the filter holder shall be displayed on the system controller.

A warning shall be issued to the host computer if the pressure drop across the filter increases by a user configurable amount between the start and end of the test.

- 2.4.8 The filter face temperature for each filter location shall be measured, monitored and recorded during a test, unless other means are employed to ensure temperature uniformity across all filters. In any case, filter face temperature shall be measured and recorded in at least one location, or as otherwise required, to document test specific compliance with CFR requirements. If the temperature is not measured directly for each filter location, the contractor shall provide a detailed engineering report clearly demonstrating how the temperature requirement can be reliably met, and documented, by the system as designed.

- 2.4.9 The system shall include 12 URG® Corporation, URG-2000-30FD stainless steel filter holders, or equivalent, that comply with the requirements of 40 CFR 86.1310-2007.

- 2.4.10 Filter holders shall be permanently marked, by etching or engraving both halves, as follows:

Phase 1-A	Phase 2-A	Phase 3-A	Phase 4-A
Phase 1-B	Phase 2-B	Phase 3-B	Phase 4-B
Phase 1-C	Phase 2-C	Phase 3-C	Phase 4-C

- 2.4.11 The system shall include a set of leak-tight plugged disconnects, or other means, for sealing off any filter position not utilized during a test. Filter holders shall also include plugs, which may be easily inserted and removed from each end of the filter holder, to seal the holders during transport to and from the EPA filter weighing room.
- 2.4.12 The particulate collection system shall utilize particle classifiers, as referenced in 40 CFR 86.1310-2007. These shall be configured in such a way as to allow easy removal of collected debris.
- 2.4.13 The particulate measurement system shall include a particulate sampler with a sample pump(s) sufficiently sized to maintain proportionate sample flow for concurrent sample collection of at least three of the previously specified filters in parallel configuration.
- 2.4.14 Reserved
- 2.4.15 The particulate sampler shall have an independent NIST traceable flow standard, isolated from sample flow, to verify sample flow measurement accuracy. The sampler shall provide for automated flow checking on command.
- 2.4.16 The particulate sampler shall provide for automated leak checking of the sampler system and filter holders.
- 2.4.17 The particulate sampler shall provide for operation and flow monitoring and totalizing in "local" mode.
- 2.4.18 The particulate sampler shall provide for other automated self-checks and diagnostic features as required by system design, to facilitate maintenance, troubleshooting, and repair.
- 2.4.19 The particulate sampling system shall include all equipment necessary for pretreatment of compressed air for secondary dilution and service requirements. EPA will provide compressed air at a minimum of 65 psi from an oil-free compressor. The equipment package delivered as part of this contract shall provide for clean compressed air, if pressure, or other compressed air quality requirements, exceed the nominal capabilities of the EPA compressed air system.

2.5 Low Level Gaseous Analytical Systems

- 2.5.1 The contractor shall provide two separate analytical systems and sample handling paths for

engine tests sampled via either as raw exhaust or the dilute CVS in either a continuous/integrated or “bag” sample container integrated basis. The analyzers shall be packaged to suit the layouts illustrated in the attached Figures, and information gathered from the site survey.

- 2.5.2 All analytical systems shall nominally use single range digital format analyzers that have high A/D resolution including five digits of counts for zero and six digits at full scale span. In certain instances analyzers may be required to be dual range in order to cover a significantly wide range of concentrations. If auto ranging is included in continuous measurement functions, it shall provide for “seamless” measurement without compromise as to accuracy, precision or data continuity.
- 2.5.3 The calibration and analysis processes shall use sampling and averaging algorithms to precisely determine gas concentrations that are generated by 2007 low emissions engines. Analyzers shall be suitable for analysis of exhaust from gasoline, diesel or alcohol fueled engines.
- 2.5.4 Each analytical system shall include a separate external bag read port with a quick disconnect.
- 2.5.5 Optimization - The optimization for all analyzers shall be an easily performed task (as automated as possible) and shall be fully described in the documentation or on-line procedures. This includes but is not limited to electrical and optical alignments, optimizing flows and pressures for FIDs and CLDs, as well as analog-to-digital converter and amplifier outputs.
- 2.5.6 Resolution and Repeatability - All analyzers shall be able to resolve a concentration that is $\pm 1\%$ of the lowest quoted range of the analyzer. For example, if a dilute analyzer is quoted with a lowest range of 1ppm it shall have a resolution better than $\pm 0.01\text{ppm}$ and repeatability of better than 0.25% of the full scale value. The repeatability is to be tested over ten alternating zeros and spans each consisting of 1 minute zero and 1 minute of span gas at approximately 85% of full scale dynamic (FSD). All ranges must conform. Where single range analyzers are fitted the specification must be met on the minimum calibration range.
- 2.5.7 Calibration - Analyzers shall be calibrated on each range identified as an active computer range using a suitable number of gas concentrations (cylinders and/or gas divider blends) to satisfy CFR requirements and to determine accuracy, resolution, and repeatability. For single range analyzers sufficient calibration points must be available to emulate the performance and response of a multi-range analyzer. Accuracy and repeatability limits should not be exceeded during the periods between calibrations.
- 2.5.8 The performance for each analytical instrument shall be checked as part of the acceptance

test process. The ranges specified are nominal values, and some latitude and flexibility is permitted if the contractor substantiates the variation.

2.5.9 Reserved

2.5.10 The contractor shall provide the following analytical instruments in the dilute analysis system.

<u>NO/NOx</u>	Oxides of Nitrogen chemiluminescence atmospheric (Heated) for continuous or bag analysis Separate capillary tubes for flow control shall be provided for the two temperature settings invoked for diesel and gasoline/methanol testing.
Ranges	0-10-500, 50-2500 ppm (scalable dual range)
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 1.5 seconds to 90 % full scale at rated instrument sample flow
Noise Level	< 0.5% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 1% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxxE \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Temperature	Heated system shall be controllable at selected temperature up to 375 ± 15 degF
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders
Interference	As per CFR 40, Part 86 and results shall not be affected by the presence or absence of oxygenated materials such as methanol
Oxidant	21% O ² in argon

<u>THC-FID</u>	Total Hydrocarbon Flame Ionization Detector - (Heated) for continuous or bag analysis
Ranges	0-10-500, 100-5000 ppmC (scalable dual range)
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 1.5 seconds to 90 % full scale at rated instrument sample flow
Noise Level	< 0.5% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 1% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxxE \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Temperature	Heated sample system shall be controllable up to 375 ± 15 degF
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders

Optimization As per CFR 40, Part 86 and CARB specifications

Methane GC/FID type for bag analysis

Ranges 0-10-50, 100-1000 ppmC (scalable dual range)
MinDetLevel < 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability < 0.50% full scale (STDEV of 10 zero/span readings)
Drift < 1 % full scale in 2 hours (Zero and Span change from previous)
Response Time < 20 seconds total measurement cycle
Noise Level < 1% full scale (Noise = % CVar of 25 readings)
Non-Linearity < 1% full scale (%NL = $100\% * (.5 * FS - Midscale) / Fullscale\ Conc$)
Outputs Digital display and transfer for computer storage ($\pm x.xxxxxxE \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Calibration As per CFR 40, Part 86 using automated dividers and cylinders
Optimization As per CFR 40, Part 86 and CARB specifications

Methane Selective catalytic type (“cutter”) for heated continuous measurement

Ranges 0-10-500 ppmC
MinDetLevel < 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability < 0.5% full scale (STDEV of 10 zero/span readings)
Drift < 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time < 2.5 seconds to 90 % full scale at rated instrument sample flow
Ethane conv. efficiency > 98%
Noise Level < 1% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity < 1% full scale (%NL = $100\% * (.5 * FS - Midscale) / Fullscale\ Conc$)
Outputs Digital display and transfer for computer storage ($\pm x.xxxxxxE \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Temperature Heated system shall be controllable up to 375±15 degF
Calibration As per CFR 40, Part 86 using automated dividers and cylinders
Optimization As per CFR 40, Part 86 and CARB specifications

Dilute CO NDIR, optical filter, capacitive type for continuous or bag analysis.
Other technologies that are equivalent will be considered.

Ranges 0-50-1000 ppm (scalable single range)

MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 3.0 seconds to 90 % full scale at rated instrument sample flow
Noise Level	< 0.25% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 2% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxxE \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders
Interference	As per CFR 40, Part 86

CO2 NDIR, optical filter, capacitive type for continuous or bag analysis.

Ranges	0-0.5-20 percent (scalable single range)
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 2.0 seconds to 90 % full scale (LDV) at rated instrument sample flow
Noise Level	< 0.5% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 2% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxxE \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders
Interference	As per CFR 40, Part 86

OXYGEN in Air Magnetopneumatic measurement principles. In addition to the zirconia unit as specified elsewhere for continuous fast response.

Response shall be linear over its dynamic range.

Ranges	0-1-25 percent (scalable single range)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 2.0 seconds to 90 % full scale (LDV) at rated instrument sample flow
Noise Level	< 0.5% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 2% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxxE \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders

- 2.5.11 The contractor shall provide the following analytical instruments in the raw exhaust gas analysis system.

<u>NO/NO_x</u>	Oxides of Nitrogen chemiluminescence atmospheric for modal testing to optimize the signal/noise ratio for low ppm. Separate capillary tubes for flow control shall be provided for the two temperature settings invoked for diesel and gasoline/methanol testing. (235 degF and 375 degF)
Ranges	0-10-500, 50-2500 ppm (scalable dual range)
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 1.5 seconds to 90 % full scale at rated instrument sample flow
Noise Level	< 0.5% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 1% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxx E \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Temperature	Heated system shall be controllable at selected temperature up to 375 \pm 15 degF
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders
Interference	As per CFR 40, Part 86 and results shall not be affected by the presence or absence of oxygenated materials such as methanol

THC-FID Total Hydrocarbon Flame Ionization Detector - (Heated)

Ranges	0-10-500, 100-5000 ppmC (scalable dual range)
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 1.5 seconds to 90 % full scale at rated instrument sample flow
Noise Level	< 0.5% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 1% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxx E \pm nn$), and analog output capability (0-5 or 0-10 VDC)
Temperature	Heated sample system shall be controllable up to 375 \pm 15 degF
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders
Optimization	As per CFR 40, Part 86 and CARB specifications

Methane Selective catalytic type (“cutter”) for heated continuous measurement

Ranges	0-50-2500 ppmC
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.5% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 2.5 seconds to 90 % full scale at rated instrument sample flow
Ethane conv. efficiency	> 98%
Noise Level	< 1% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 1% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxxE\pm nn$), and analog output capability (0-5 or 0-10 VDC)
Temperature Calibration	Heated system shall be controllable up to 375 \pm 15 degF
Optimization	As per CFR 40, Part 86 using automated dividers and cylinders

CO NDIR, optical filter, capacitive type. Other technologies that are equivalent will be considered.

Ranges	0-0.5- 10 percent (scalable single range)
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 2 hours (Zero and Span change from previous)
Response Time	< 1.5 seconds to 90 % full scale at rated instrument sample flow
Noise Level	< 0.5% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 2% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxxE\pm nn$), and analog output capability (0-5 or 0-10 VDC)
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders
Interference	As per CFR 40, Part 86

CO2 NDIR, optical filter, capacitive type

Ranges	0-0.5-20 percent (scalable single range)
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 8 hours (Zero and Span change from previous)
Response Time	< 2.0 seconds to 90 % full scale (LDV) at rated instrument sample flow
Noise Level	< 0.5% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 2% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage ($\pm x.xxxxxxE\pm nn$), and analog output capability (0-5 or 0-10 VDC)
Calibration	As per CFR 40, Part 86 using automated dividers and cylinders

Additional Analysis System Requirements

The analytical systems shall contain instruments meeting the specifications listed above. The following additional items shall also be included with each system. Raw and dilute gas analytical system, as describe above, shall be considered to be separate systems for purposes of describing the following requirements.

- 2.5.12 Permanent labels shall be attached to the analyzer console, in English, to identify each analyzer in the console and the nominal ranges.
- 2.5.13 The D005 system shall include a NOx converter efficiency tester - fully automated per the CFR.
- 2.5.14 Each system shall include an automated heated purge of the sample transfer path to remove residual HC contamination. Such a system is described in SAE paper 2002-01-0046.
- 2.5.15 Continuous sampling systems shall include all necessary provisions for sample removal and preconditioning, as required.
- 2.5.16 The heated, dilute FID, CH₄ and NO_x instruments shall be configured for continuous sampling from the tunnel zone via a heated probe fitted to tunnel. In addition the continuous dilute analyzers shall also be configured to analyze bag samples via a simple command from the host computer.

Heated probes, heated sample lines and heated filters and associated temperature controllers and temperature measurement and readout devices shall be provided for each analytical system. The configuration of system components shall minimize sample line length to the extent practical. The temperature of heated components shall be uniform, not varying by more than 20% of the nominal set point range at any point. The units shall also contain a heated pump and filter. All lines connecting the heated analyzers to the system manifold, sample bags or other areas shall be heated and monitored in accordance with the CFR requirements. All temperature monitoring data shall be transmitted to the test cell control computer system for test quality monitoring.

These systems shall also integrate hardware and automated functions for leak checking, backflush purge, zero/span checking via an overflow configuration, and the capability to measure sample hangup in the line.

- 2.5.17 Other gases shall be sampled with a heat traced transfer path that prevents any sample condensation, as required.

- 2.5.18 A process, and associated hardware/software, for semi-automated calibration and verification of calibration curves, and quality control diagnostics to enable the assessment of long term trends or changes in analyzer performance characteristics, shall be provided. This shall include highly precise and accurate gas divider or blending device capable of generating accurate calibration gases automatically and meeting the minimum requirements of the CFR Part 86 and the NVFEL in-house test procedure criteria for all analyzers - bag and continuous. A flow calibration certificate, to a traceable National Standard, shall be provided along with this hardware. The gas divider system shall have the capability to generate 25 or more user definable points with the minimal cut point at 0.2% FS and with an accuracy of $\pm 1\%$, or better, of point down to 10% of full scale. Complete calibration sequences shall be possible via semi-manual control or automatic computer control in an unattended mode.
- 2.5.19 Analytical response rates and transport delays shall be measured, documented, and compensated for, in the entire measurement system. Specific automated functions shall be provided for checking and updating response times.
- 2.5.20 Plumbing for the transfer of zero and span gases, as well as the dilute exhaust samples, shall be of 316 passivated and electropolished stainless steel ($R_a < 10$) tubing construction only. Short lengths of steel braided Teflon tubing may be used on pump inlets and outlets for vibration isolation. All solenoid valves will have stainless steel bases and plungers constructed of a durable material which does not out-gas or otherwise change the composition of the gas flowing past them.
- 2.5.21 EPA shall provide zero, span and utility gases delivered via 1/4" stainless steel lines to a valve rack in the equipment room adjacent to the test site. Span gas pressures shall be set at a nominal 15 psig at the cylinder. The delivered analysis systems shall include internal regulators to provide for the final pressure regulation for consistent flow control in the zero, span, and sampling modes to minimize any effects from pressure differences. Each gas connections shall have a sintered metal filter installed at the bench inlet.
- 2.5.22 Each analyzer shall accommodate at least one span gas and one mid-span gas inlet per computer active analyzer curve. Span gases can be shared between analytics and ranges, where concentrations permit. Span concentrations shall be between 85% and 100% of the nominal upper range concentration. Mid-span gases shall be between 15% and 50% of the nominal upper range concentration. The bench should be capable of providing a dedicated mid-span for each curve established on an analyzer or using a lower span gas as the mid-span for a curve.
- 2.5.23 All pump components in contact with the gas must be of materials which are unaffected by prolonged exposure to exhaust and span gas and must be mounted so that they produce no unwanted effects via vibration transmission. The pump materials should also be constructed

of materials which do not contribute to the sample concentration through out-gassing. All internal pipework to be electro polished and chemically passivated stainless steel. PTFE or other suitable material not affecting gas concentrations can be used but this use shall be minimized. Additionally, all service inputs must be clearly labeled.

- 2.5.24 Any fittings used must be compatible with the pipework installation, be good quality and installed to good engineering practices. All pipework systems should be pressure tested and proven to have no leaks. As installed there must be no contamination that would influence measurements on any available ranges of the analyzers. Low range analyzers require purge of the analytical equipment and back flush of the sample lines. This should be performed with a suitably clean supply of zero nitrogen.
- 2.5.25 Filters shall be provided to remove particles bigger than 0.3 micron in the sample before entering any analyzer. These filters shall have an efficiency of greater than 99% and be made from a non-reactive material. Filters shall not contain any large changes in volume cross-section which cause exponential change/time shift of a transient modal concentration profile.

3.0 Heavy Duty Engine Test Cell 2 Measurement System Requirements

3.1 Measurement System Layout and Configuration

3.1.1 The emissions measurement equipment for this test cell shall include:

- (a) Raw exhaust sampling and raw gaseous sample analysis system
- (b) Particulate matter secondary dilution and sampling system

The size and general layout of this test cell are in keeping with those described for HD 5, as described in Section 2.1. Room dimensions are essentially identical. The layout is also very similar except for the differences in size with respect to the dynamometer and CVS/Tunnel system. One further difference is that the HD 2 test cell is to the left of the equipment room and adjacent to the left side of the control room, instead of to the right as it is in HD 5.

3.2 Raw Exhaust Sampling and Raw Gaseous Sample Analysis System

3.2.1 The contractor shall fabricate, install and implement a raw exhaust sampling and raw gaseous sample analysis system in HD 2 as outlined in Section 2.5.

4.0 Other Support Equipment

- 4.1 The contractor shall supply, install and integrate an electronic barometer with an accuracy of 0.03 inches mercury, or better, as part of the measurement system for HD Dyno 5.
- 4.2 The contractor shall supply, install and integrate an electronic hygrometer, Visala HMP 233 with remote display, as part of the measurement system for HD Dyno 5.
- 4.3.1 The contractor shall supply an engine air inlet system for HD 5. This air inlet system shall be constructed of 6" OD stainless steel tubing with a flex hose connection to the engine. Engine air shall be drawn from inside the test cell and shall pass through a filter and an ultrasonic air flow meter, or equivalent. The engine air inlet tubing shall also include a butterfly valve and actuator for setting the inlet air restriction to the engine. This is normally a static adjustment, typically made while the engine is running at rated conditions.
- 4.3.2 The HD 5 engine air inlet flow meter shall have a precision and accuracy of $\pm 0.5\%$ in the range of 50 to 1200 SCFM.
- 4.3.3 As with the exhaust back pressure setting device, the engine air inlet restrictor device shall be adjustable from the control room, and the means of adjustment shall be conveniently located adjacent to the exhaust back pressure adjustor. The device shall be designed in such a way that the restriction is fixed until explicitly changed, and will remain unchanged during loss of building power or compressed air.
- 4.3.4 [Enhancement] The hardware for engine air inlet restriction shall include a display indicating the nominal position of the restrictor.
- 4.3.5 [Enhancement] The contractor shall provide an air inlet restrictor and exhaust backpressure controller that are capable of the above requirements, plus closed loop control under steady state conditions. The restrictor shall function in the following two modes:
 - (a) Once activated the restrictor shall control the restriction until a stable condition at the desired set point. Once the desired condition is achieved, the device would then hold the restrictor in a fixed position until a different setting is desired.
 - (b) Once activated the restrictor shall actively control the restriction to a stable condition at the desired set point until the control function is explicitly disabled.

The closed loop control function shall be configured in such a way as to provide a damped and limited response appropriate to the control of engine air inlet restriction and engine exhaust pressure, so as not to expose an operating engine to extreme conditions. The controller shall display set point, feedback, position and status (e.g. "on," "off,"

“active,” “hold.”)

- 4.4 Except as noted elsewhere, the contractor shall provide a supply of consumable items sufficient for approximately 6 months of continuous operation.

5.0 Documentation Requirements

- 5.1 The contractor shall submit detailed instructions and documentation through training videos, demo disks, or CDs. Documentation shall be in the English language and shall include at a minimum, technical and operational manual(s), including a complete description of the system's control algorithms, performance measures, calibration procedures, system hardware and software operation, and response characteristics.
- 5.2 The contractor shall provide complete documentation for each system in this contract, including mechanical layout and hydraulic and pneumatic schematics, wire lists, color coding, electrical schematics, piping/tubing diagrams, operating and repair manuals and computer system documentation.
- 5.3 For each system delivered a minimum of three (3) complete, hard copy sets of documentation shall be provided. In addition the contractor shall also provide the documentation in computer readable, user modifiable form. Microsoft Word, WordPerfect, AutoCADD, VectorWorks, Microsoft Visio and Microsoft Excel are acceptable file formats as well as any that are compatible with standard translator/conversion tools provided by those applications. Other formats may be acceptable for secondary or supplemental information. Minor exceptions to the requirement for a computer readable version of documentation may be made in unusual cases.
- 5.4 The contractor shall provide a recommended set of detailed calibration, verification and preventative maintenance procedures, schedules, and recommended spare parts inventory.
- 5.5 The contractor shall provide a listing of all system warning and alarm messages, with full explanation as to their exact meaning, impact and action required.
- 5.6 The contractor shall provide a complete "Lock-Out, Tag-Out" instruction for equipment requiring energy-isolating devices in accordance with the OSHA rule on the Control of Hazardous Energy (Lockout/Tagout) of Title 29 of the Code of Federal Regulations (29 CFR) Part 1910.147.
- 5.7 The contractor shall provide complete documentation of the quality control features of the delivered systems, and instructions as to their maintenance and utilization. This documentation shall be sufficient to provide system documentation and instruction to satisfy the relevant requirements of ISO DIS 17025 - General Requirements for the Competence of Testing and Calibration Laboratories.
- 5.8 The contractor shall supply a list of consumable items with recommended supply sources, as well as a recommended parts list for routine maintenance operations.

- 5.9 The contractor shall supply a complete parts list(s) including the model and/or part number designations of all component parts, as well as the address, phone number(s), and point(s) of contact for all subcontractors and vendor component parts

6.0 Acceptance Testing Requirements

- 6.1 The contractor shall develop a comprehensive final acceptance plan, approved by EPA, which will verify that all requirements contained in this Statement of Work, and referenced documents, have been achieved in the delivered system(s). This verification will take place at the contractor's point of final assembly prior to delivery of the system to EPA.

Prior to commencement of acceptance testing, the EPA Project Officer must approve the acceptance plan, in writing. Once approved, the contractor shall provide the EPA Project Officer with a detailed schedule of acceptance activities at least 7 days in advance. At least 2 days in advance, the Project Officer will indicate which activities EPA personnel will observe.

- 6.2 The acceptance shall be based on demonstrated performance, including simulated exhaust sampling and analysis. The contractor will repeat this verification process again after installation at NVFEL to the extent necessary, to verify full compliance with the requirements in the final installation. The plan shall consider all aspects of measurement system variability, so that all test results demonstrate compliance with an estimable and high level of statistical confidence.
- 6.3 All acceptance testing shall be the responsibility of the contractor. The contractor, at the contractor's expense, shall rectify all non-compliant conditions. If repairs or changes are made, the contractor shall repeat acceptance testing to demonstrate the acceptable quality of the final product to the extent necessitated by the scope of the repair or change. The contractor shall prepare a report for each phase of acceptance testing that describes all the various tests and reviews conducted as part of the acceptance activity, the outcomes of those tests and a description of follow up actions, as required.
- 6.4 EPA personnel shall observe the acceptance process. The Project Officer may waive the opportunity to observe certain aspects of the acceptance process.
- 6.5 The acceptance plan shall be cross-referenced, section by section in a straightforward manner, to the requirements of this Statement of Work. The plan shall be designed in such a manner as to also form the basis of a final acceptance report. The acceptance plan shall also address all other requirements deemed significant and appropriate by the contractor, based on the specific design and configuration of their system and significant proprietary features.
- 6.6 Upon completion of the off-site testing, the contractor shall deliver a preliminary acceptance report to EPA. This report shall provide documented evidence of compliance to the requirements of this Statement of Work and the Acceptance Plan, with content and format suitable for successful audit to ISO DIS 17025 standards.
- 6.7 Engine testing portions of the on-site acceptance activity shall be performed at a sufficient range of conditions and over a sufficient range of test types to fully and statistically demonstrate compliance with the requirements of this Statement of Work and applicable

regulatory requirements.

- 6.8 Acceptance activities shall include an evaluation of the potential for aliasing or other inadvertent system effects on precision and accuracy.
- 6.9 The demonstration of dynamometer interface requirements shall be exempt from off-site acceptance testing, but shall be included in acceptance testing at NVFEL.
- 6.10 Acceptance tests shall also demonstrate that immediately before shipping, the system is computer virus free. Once delivered, EPA will scan the delivered computer systems using its elaborate check-out procedures and witnessed by the contractor before any connection is made to EPA computers or network systems. After equipment delivery to EPA, the contractor shall also scan provided computers for viruses before and after performing any system updates using removable media are made during the performance of work under this contract. Infected computers and/or media will be returned to the contractor for resolution. At its discretion, EPA virus scans may be waived for non-Windows computer systems.

7.0 Warranty and Spare Parts

- 7.1 The contractors shall warranty all parts, labor, control systems, and equipment for the performance and functionality of their systems for a minimum of one year after formal EPA system acceptance and approval. Repair service and spare parts shall be available within three working days of request during the one year warranty period.
- 7.2 This warranty shall provide for cost-free repair or replacement of covered hardware and software. This warranty shall not reduce any requirement in this Statement of Work. Contractors shall outline their complete warranty provisions.
- 7.3 The contractor shall provide one (1) complete set of recommended on-hand spare parts at the time of installation that will ensure reliable overall operation of the complete system and shall provide one (1) extra set of sensors that are subject to damage or failure during testing.
- 7.4 The contractor shall offer an option for an Extended Service Contract, renewable every year for a period of 4 years after the warranty period has expired.

8.0 Training

8.1 Heavy Duty Dyno 5 Training

After this system has been commissioned and preliminary acceptance tests have been completed, the contractor shall provide at least 16 hours of basic training for up to eight (8) people and (24) hours of advanced training and (8) hours of systems administration training for up to four (4) people. The content of advanced training shall be selectable by EPA. This training shall be conducted on the installed system at NVFEL or at a mutually acceptable location. The training shall be completed within 30 days of final system acceptance by EPA.

8.2 Heavy Duty Dyno 2 Training

After this system has been commissioned and preliminary acceptance tests have been completed, the contractor shall provide at least 16 hours of basic training for up to eight (8) people and (24) hours of advanced training and (8) hours of systems administration training for up to four (4) people. The content of advanced training shall be selectable by EPA. This training shall be conducted on the installed system at NVFEL or at a mutually acceptable location. The training shall be completed within 30 days of final system acceptance by EPA.

9.0 Optional Equipment

- 9.0.1 The contractor shall offer the following option items in addition to the base systems. All optional equipment provided under this system shall be subject to all general requirements of this Statement of Work and the relevant requirements of Sections 4, 5, 6, 7 and 8, as well as other requirements stated below and other referenced sections of the Statement of Work.

9.1 Option for Additional Dilute Exhaust Gas Analysis System

- 9.1.1 The contractor shall offer an option for one additional dilute exhaust gas analytical systems as described in Section 2.5.10. This shall include standard set-up and commissioning of the delivered system. All other related requirements of Section 2.5 shall apply to this system. This system shall be capable of transmitting data and receiving basic commands from a test cell host computer equivalent to that described in Appendix C.

9.2 Option for Additional Raw Exhaust Gas Analysis Systems

- 9.2.1 The contractor shall offer an option for up to two additional raw engine exhaust gas analytical systems as described in Section 2.5. This shall include standard set-up and commissioning of the delivered systems. All other related requirements of Section 2.5 shall apply to this system. These systems shall be capable of transmitting data and receiving basic commands from a test cell host computer equivalent to that described in Appendix C.

9.3 Option to add Sulfur Dioxide Analyzer to Each Analysis System

- 9.3.1 For each engine exhaust gas analytical system delivered, including the base systems, the contractor shall offer an option for a sulfur dioxide analyzer, to be exercised concurrently with the award of the exhaust gas analytical system.

- 9.3.2 The sulfur dioxide analyzer shall meet or exceed the following characteristic:

NDIR, optical filter, capacitive type. Other technologies that are equivalent will be considered.

Ranges	Nominal 0-100, 0-5000
MinDetLevel	< 0.5% full scale (MDL = lowest conc that exceeds noise level spec)
Accuracy	± 2% of reading down to 10 ppm
Repeatability	< 0.25% full scale (STDEV of 10 zero/span readings)
Drift	< 1 % full scale in 2 hours (Zero and Span change from previous)
Response Time	1.5 seconds to 90 % full scale at rated instrument sample flow
Noise Level	< 0.2% full scale (Noise = %CVar of 100 readings at 10Hz)
Non-Linearity	< 5% full scale (%NL = 100%*(.5*FS - Midscale)/Fullscale Conc)
Outputs	Digital display and transfer for computer storage (±x.xxxxxxE±nn), and

analog output capability (0-5 or 0-10 VDC)

- 9.3.3 Water interference of the sulfur dioxide analyzer shall be minimized through the use of a 2 foot long Perma-Pure dryer (or comparable) in the sample line. This type of water removal will minimize sample loss of SO₂. The Perma-pure dryer shall use nitrogen as its purge gas and have the ability to purge the dryer when the bench is not in sample mode.
- 9.3.4 The sulfur dioxide analyzer shall provide for correction of hydrocarbon interference using propane as a reference gas to determine a first order correction curve. This correction shall be nominally performed using the first order correction curve based on real time THC measurement.
- 9.3.5 The option for sulfur dioxide determination shall include all features and accessories necessary to make it fully functional for raw exhaust gas sampling and analysis including, but not limited to, software adaptation, all fittings valves and filters, heated sample lines and heated component temperature controllers.

9.4 Option for EGR Determination

- 9.4.1 For each raw engine exhaust gas analytical systems delivered, including the base systems, the contractor shall offer an option for equipment and software for the determination of the percentage of engine exhaust gas recirculation (EGR). This option will be exercised concurrently with the award of the raw exhaust gas analytical system.
- 9.4.2 The option for EGR determination shall include all features and accessories necessary to make it fully functional for raw exhaust gas sampling and analysis including, but not limited to, software adaptation, all fittings valves and filters, heated sample lines and heated component temperature controllers.

9.5 Option for Modal Mini-Diluter

- 9.5.1 For each raw engine exhaust gas analytical system delivered, including the base systems, the contractor shall offer an option for a modal mini-diluter (MMD) to provide a fixed rate of dilution of the raw exhaust gas
- 9.5.2 The option for a MMD shall include all features and accessories necessary to make this feature fully functional including, but not limited to, software adaptation, all fittings valves and filters, heated sample, filters, lines and heated component temperature controllers.
- 9.5.3 The MMD system shall be packaged to minimize the equipment footprint and to provide easy mobility in the test site if movement is required. The packaging for the MMD design shall provide serviceability, allowing access to components typically requiring maintenance.
- 9.5.4 [Enhancement] A calibration panel shall be supplied on the MMD cabinet that includes the interface for all sensor (RTD, thermocouple, transducer, etc.) as needed for calibrations.

- 9.5.4 Any cabinets or racks used to contain controls and displays shall utilize a standard 19" instrument rack mount. All function controls shall be clearly labeled and indicated when active. This display may be a combination of computer display screens for the programmable functions and physical hardware such as buttons, switches, lights, and meters for other appropriate functions. All connectors and appropriate lengths of cable shall be provided for the installation.
- 9.5.5 The MMD shall use pumps with a Teflon diaphragm, non HC emitting lubricants, a stainless steel head (with 16 micron finish), and rubber anti-vibration pads, such as KNF Neuberger 7261.1.2TPP, or equivalent. The pump(s) shall be sized to ensure adequate flow and pressure for the metering devices, such as critical flow in CFVs. These pumps shall be installed in a manner that facilitates ease of service or replacement.
- 9.5.6 All solenoid valves shall nominally be oxygen service grade two-way valves, normally-closed, rated for continuous duty. They shall be of a design that has minimized dead volume and surface exposure to the sample and a pressure drop that prevents condensation of moisture in the sample.
- 9.5.7 Teflon valve seats shall be used on solenoid valves to minimize system contaminant out gassing. Pressure regulators used to supply analytical, purge, and diluent gas shall use a stainless steel diaphragm. There shall be no Viton rubber used in the regulator or solenoid valves. All mounted components (solenoids, MFC, etc.) shall use a stainless steel base.
- 9.5.8 The plumbing for the Modal Mini-Diluter shall be electropolished 316 stainless steel or bright, annealed stainless steel tubing, chemically passivated with 10% nitric acid or equivalent. The sample lines shall be cleaned and baked, and demonstrated to be contaminant-free prior to assembly of the system. Short Teflon lines with a stainless steel overbraid may be used for the connections to the pumps for vibration isolation.
- 9.5.9 Sample lines shall be designed and configured so as to minimize the residual dead volume of the system.
- 9.5.10 Filters used in the sample transfer shall have minimal dead volume and pressure drop, shall promote slug flow of transient profiles, and shall not react with the exhaust constituents. A small cylindrical sintered metal annular type filter may provide such characteristics. The exhaust sample filter shall be made of media that does not produce or absorb HC gases or in any other way interfere with chemical measurements within the scope of this contract. The filter shall be located appropriately for easy accessibility. The filter shall be protected so that its integrity is not effected when the sample pump is turned on or off. There shall be a readily observable indication of filter condition.
- 9.5.11 The MMD dilution ratio shall be nominally 5:1, with a total sample flow appropriate to the requirements of the analytical equipment. These flows shall be maintained and controlled by use of common flow metering devices such as CFOs, CFVs, or MFCs in a configuration that performs to the specifications. The temperatures and pressures related to each flow device shall be measured by transducers and logged with the test data.

- 9.5.12 All flow metering devices shall be calibrated to an accuracy of $\pm 1\%$, traceable to NIST, and shall have a minimum precision of $\pm 0.25\%$. A complete calibration report for these devices shall be delivered to EPA prior to system acceptance.
- 9.5.13 Each metering device shall be uniquely identified and permanently labeled for easy cross-reference to system documentation. The labeling shall also include a flow directional arrow. All line plumbing shall also be labeled in keeping with this identification scheme.
- 9.5.14 The bulkhead fittings on the MMD cabinet shall provide for continuous dilute sample analysis, vent, dilution gas, and backflush purge.
- 9.5.15 All components in contact with exhaust sample, or diluent air, shall be made from materials that do not alter, contribute to, or interfere with the measurement of any chemical present in automotive exhaust.
- 9.5.16 The EFDS/MMD sampling system shall have two modes of control operation, a local (manual) mode and remote (automated) mode. Local control means that the function can be selected and controlled by the operator. The EFDS/MMD shall provide for local control at the EFDS/MMD interface, or "front panel". Mode of operation shall be selectable on the front panel of the device and through the computer interface.
- 9.5.17 Mini-diluter operation mode selections shall include "Idle", where no gas is flowing, "Ready", where zero gas is routed through all metering devices, "Continuous Sample", where raw exhaust gas and dilution zero gas flows through the metering devices and a pulsed backflush purge mode to clean the inlet plumbing of particulate buildup.
- 9.5.18 The MMD software shall provide for the calibration, verification and related documentation of all instrumentation on the Mini-Diluter, including pressure transducers, temperature sensors, humidity sensors, and mass flow controllers.

9.6 Optional Gaseous Sample Source Switching

For each raw engine exhaust gas analytical system delivered, including the base systems, the contractor shall offer an option for switching between 2, 3 or 4 sample lines.

- 9.6.1 The option for multi-sample line switching shall include all features and accessories necessary to make this feature fully functional including, but not limited to, software adaptation, all fittings valves and filters, heated sample lines and heated component temperature controllers.

9.7 Optional Particulate Matter, Secondary Dilution and Sampling System

- 9.7.1 The contractor shall offer an option to fabricate, install and implement up to three additional particulate matter, secondary dilution and sampling systems as outlined in Section 2.4.

(a) The contractor shall fabricate, install and implement a particulate matter, secondary

dilution and sampling system, as outlined in Section 2.4, in test cell HD 2.

- (b) The contractor shall fabricate, install and implement a particulate matter, secondary dilution and sampling system, as outlined in Section 2.4, in test cell HD 1. General information regarding this test cell is found in Appendix C.
- (d) The contractor shall fabricate, install and implement a particulate matter, secondary dilution and sampling system, as outlined in Section 2.4, in a location to be determined at time option is exercised. For purposes of preparing a proposal the installation and commissioning of this system shall be considered equivalent to the installation in HD 1.

Figures

Note: These Figures have been consolidated into an Adobe Acrobat PDF file
named HDEngSAS.pdf

Figure 1. LNS/TDAP System Architecture (Block Diagram)

Figure 2. Heavy Duty Cell 5 Layout (Floorplan and Elevations)

Figure 3. Heavy Duty Cell 2 Layout (Floorplan and Elevation)

Appendices

Appendix A.	Abbreviation and Terms
Appendix B.	Reserved
Appendix C	Description of Heavy Duty Dynamometer 1
Appendix D	Schedule of Deliverables

Appendix A

Abbreviations and Terms

AISC	-	American Institute of Steel Construction
ASHRA	-	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	-	American Society of Mechanical Engineers
BMD	-	Bag Mini-Diluter
BOCA	-	Building Officials' Code of America
CAA	-	Clean Air Act Amendments
CARB	-	California Air Resources Board
CFH	-	Cubic Feet per Hour
CFM	-	Cubic Feet per Minute
CFO	-	Critical Flow Orifice
CFR	-	Code of Federal Regulations
CFV	-	Critical Flow Venturi
CL	-	Chemiluminescence Analyzer (NO _x)
CNG	-	Compressed Natural Gas
CVS	-	Constant Volume Sampler
DF	-	Dilution Factor, expressed as (parts diluent + parts sample)/parts sample
DR	-	Dilution Ratio, expressed as parts diluent : parts sample
EFMS	-	Exhaust Flow Measurement System
EPA	-	Environmental Protection Agency
FID	-	Flame Ionization Detector
FM	-	Factory Mutual
FTIR	-	Fourier Transform Infra Red
FTP	-	Federal Test Procedure
HEPA	-	High Efficiency Particulate Absorption
HFET	-	Highway Fuel Economy Test
HZ	-	Hertz (per second)
IFC	-	InterFace Computer
ISO	-	International Standards Organization
LA4	-	Los Angeles Driving Cycle #4
LPM	-	Liters Per Minute
LNS	-	Laboratory Network System
MFC	-	Mass Flow Controller
MMD	-	Modal Mini-Diluter
MSDS	-	Material Safety Data Sheets
NDIR	-	Non Dispersive Infra Red
NEC	-	National Electrical Codes
NEMA	-	National Electrical Manufacturers Association
NFPA	-	National Fire Prevention Association
NIST	-	National Institute of Standards and Technology
NMOG	-	Non-methane Organic Gas
NVFEL	-	National Vehicle and Fuels Emissions Laboratory

OSHA	- Occupational Safety and Health Administration
PM	- Particulate Matter
P/N	- Part Number
POC	- Point of Contact
PSIA	- Pounds per Square Inch Absolute
PSIG	- Pounds per Square Inch Gauge
RFP	- Request for Proposal
RPM	- Revolutions Per Minute
RTD	- Resistance Temperature Detector
SCFH	- Standard Cubic Feet per Hour
SCFM	- Standard Cubic Feet per Minute
SOW	- Statement of Work
SLPM	- Standard Liters Per Minute
T90	- Time for an instrument to reach 90% of a final steady unit change value
TDAP	- Test-control, Data Acquisition and Processing system
UBC	- Uniform Building Codes
UDDS	- Urban Dynamometer Driving Schedule
ULEV	- Ultra-Low Emitting Vehicle
VAC	- Voltage w/ Alternating Current
VDC	- Voltage w/ Direct Current
VDA	- Video Driver's Aid
WC	- Water Column

Appendix B

Reserved

Appendix C

Description of Heavy Duty Dynamometer 1

Engine Dynamometer: GE DC 600 HP

Test Cell Controller: VXI Chassis
MTS VXIn Software, vsn 3

Dilute Emissions Sampling:

- Constant Volume Sampler: Horiba HDD / DPS - 88
- (Flow Ranges: 1000, 2000, 3000, or 4000 CFM)
- Micro controller with local and remote modes
- Communicates to test cell controller via GPIB and GPIB to LAN converter
- Test cell controller receives data and issues setpoints by LAN

Existing Particulate Sampling:

Horiba HDD / DPS - 88
Secondary dilution tunnel mounted in temperature controlled cabinet
Two test phase capability
Flow measurement with SAO's
Micro controller with local and remote modes
Communicates to test cell controller via GPIB and GPIB to LAN converter
Test cell controller receives data and issues setpoints by LAN

Description of Existing Particulate Measurement System Operation:

The particulate measurement (PM) system can operate in either a constant sample flow rate mode or in a proportional sample flow rate mode. In either case, the set up and flow selections are controlled by a micro controller on the PM system. The micro controller may be operated manually or by a remote host. In the proportional sampling mode, the micro controller receives a signal from the CVS indicating the total CVS flow rate. The micro controller uses this to calculate a proportional sample flow rate. This calculated value is used as a set point to control the sample flow rate.

Existing Dilute Emissions Measurement:

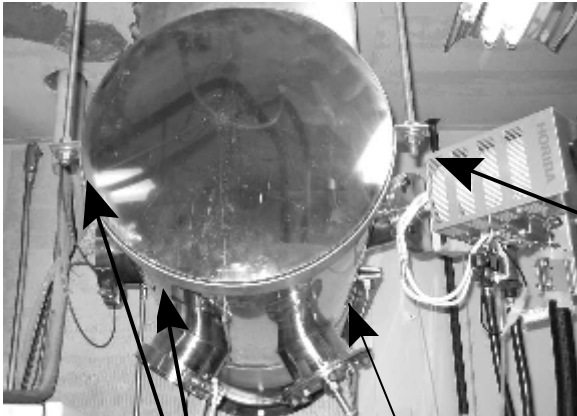
Analyzer: Horiba MEXA 7200D
Hot HC, Cold NO_x, CO, CO₂
Communicates to test cell controller via LAN

Existing Raw Emissions Measurement:

Analyzer: Horiba MEXA 7100 D EGR
Hot HC, Cold NO_x, CO, CO₂
Communicates to test cell controller via AI channels

**HD
Zon**

**Dyno 1 - Main Particulate Tunnel - Sample
e:**



Heated Gaseous Sample
Probe

Existing PM Sample Probe

Existing Spare Sample
Ports

Appendix D

Schedule of Deliverables

Dates shown are completion deadlines relative to the contract award date or exercise option date. Where dates are not shown, the contractor shall propose appropriate dates at the Project Kickoff Meeting. All days are calendar days.

A. Heavy Duty Engine Test Cell 5 Sampling and Analytical Systems

Note: It is expected that HD 5 will be available to the contractor for any prep required for installation no later than April 15, 2004.

Project Kickoff Meeting and Site Survey (25 days)

- Project Programming
- Project Management
- Technical exchange meetings and approvals
- Quality Assurance
- Status Report/Open Item Tracking

Weekly Status Report/Open Item Tracking Submission (Starting after project kickoff)

Preliminary Design Submission and Review Meeting (50 days)

- Test cell layout, equipment design and layout, functional specifications

EPA Preliminary Design Approval

Submission of Acceptance Plan for Approval

Submission of Standard-Function Report Layouts for Approval

Submission of Pretest Data Entry and Test Set-Up Screens for Approval

Submission of Calculation Verifications for Approval

Submission of Preliminary Equipment Qualification Results to EPA (180 days)

- Calibration Results
- Repeatability/Stability Test
- PM Tunnel Performance
- Submission of Calibration Reports and Measurement Traceability Documentation

Contractor-Site Acceptance Testing Completed (190 days)

Submission of Summary Report of Contractor-Site Acceptance Results (195 days)

Submission of Installation Material Data Safety Information to EPA for approval

Equipment Delivery Date Confirmation to EPA (10 days in advance of shipment)

EPA Authorization to Ship

EPA-Provided Contractor Safety Training

Equipment Delivery to EPA (210 days)

Equipment Installation (240 days)

Equipment Commissioning (260 days)

Final Acceptance Testing (300 days)

Training and Submission of all Documentation (320 days)

Final EPA Approval

Appendix D - Continued

Schedule of Deliverables

B. EPA Test Cell 2 - Raw Exhaust Sampling and Analysis

Option 9.1 - Additional Dilute Exhaust Gas Analysis System

Project Kickoff Meeting and Site Survey (25 days)

- Project Programming
- Project Management
- Technical exchange meetings and approvals
- Quality Assurance
- Status Report/Open Item Tracking

Weekly Status Report/Open Item Tracking Submission (Starting after project kickoff)

Preliminary Design Submission and Review Meeting (40 days)

EPA Preliminary Design Approval

Submission of Acceptance Plan for Approval

Submission of Standard-Function Report Layouts for Approval

Submission of Pretest Data Entry and Test Set-Up Screens for Approval

Submission of Calculation Verifications for Approval

Submission of Preliminary Equipment Qualification Results to EPA (170 days)

Calibration Results

Repeatability/Stability Test

Submission of Calibration Reports and Measurement Traceability Documentation

Contractor-Site Acceptance Testing Completed (175 days)

Submission of Summary Report of Contractor-Site Acceptance Results (180 days)

Submission of Installation Material Data Safety Information to EPA for approval

Equipment Delivery Date Confirmation to EPA (10 days in advance of shipment)

EPA Authorization to Ship

EPA-Provided Contractor Safety Training

Equipment Delivery to EPA (190 days)

Equipment Installation

Equipment Commissioning (215 days)

Final Acceptance Testing (225 days)

Training and Submission of all Documentation (250 days)

Final EPA Approval

Appendix D - Continued

Schedule of Deliverables

C. Option 9.2 - Additional Raw Exhaust Gas Analysis Systems

Project Kickoff Meeting and Site Survey (25 days)

- Project Programming
- Project Management
- Technical exchange meetings and approvals
- Quality Assurance
- Status Report/Open Item Tracking

Weekly Status Report/Open Item Tracking Submission (Starting after project kickoff)

Preliminary Design Submission and Review Meeting (60 days)

EPA Preliminary Design Approval

Submission of Acceptance Plan for Approval (100 days)

Submission of Standard-Function Report Layouts for Approval

Submission of Pretest Data Entry and Test Set-Up Screens for Approval

Submission of Calculation Verifications for Approval (120 days)

Submission of Preliminary Equipment Qualification Results to EPA (170 days)

Calibration Results

Repeatability/Stability Test

Submission of Calibration Reports and Measurement Traceability Documentation

Contractor-Site Acceptance Testing Completed (175 days)

Submission of Summary Report of Contractor-Site Acceptance Results (180 days)

Submission of Installation Material Data Safety Information to EPA for approval

Equipment Delivery Date Confirmation to EPA (10 days in advance of shipment)

EPA Authorization to Ship

EPA-Provided Contractor Safety Training

Equipment Delivery to EPA (190 days)

Equipment Installation

Equipment Commissioning (215 days)

Final Acceptance Testing (225 days)

Training and Submission of all Documentation (250 days)

Final EPA Approval

D. Option 9.3 - Add Sulfur Dioxide Analyzer to Each Analysis System

If option is exercised concurrent with purchase of analysis system the exercise of the option shall have no effect on the delivery schedule. If option is exercised after analysis system has been awarded the delivery schedule shall be negotiable, not to exceed 210 days.

E. Option 9.4 - Add Instrumentation for EGR Determination

If option is exercised concurrent with purchase of analysis system the exercise of the option shall have no effect on the delivery schedule. If option is exercised after analysis system has

been awarded the delivery schedule shall be negotiable, not to exceed 210 days.
Appendix D - Continued

Schedule of Deliverables

F. Option 9.5 - Add Modal Mini-Diluter

If option is exercised concurrent with purchase of analysis system the exercise of the option shall have no effect on the delivery schedule. If option is exercised after analysis system has been awarded the delivery schedule shall be negotiable, not to exceed 210 days.

G. Option 9.6 - Add Gaseous Sample Source Switching

If option is exercised concurrent with purchase of analysis system the exercise of the option shall have no effect on the delivery schedule. If option is exercised after analysis system has been awarded the delivery schedule shall be negotiable, not to exceed 120 days.

H. Option 9.7 - Optional Particulate Matter, Secondary Dilution and Sampling System

Project Kickoff Meeting and Site Survey (25 days)

- Project Programming
- Project Management
- Technical exchange meetings and approvals
- Quality Assurance
- Status Report/Open Item Tracking

Weekly Status Report/Open Item Tracking Submission (Starting after project kickoff)

Preliminary Design Submission and Review Meeting (70 days)

EPA Preliminary Design Approval

Submission of Acceptance Plan for Approval (100 days)

Submission of Standard-Function Report Layouts for Approval

Submission of Pretest Data Entry and Test Set-Up Screens for Approval

Submission of Calculation Verifications for Approval (120 days)

Submission of Preliminary Equipment Qualification Results to EPA (180 days)

Calibration Results

Repeatability/Stability Test

Submission of Calibration Reports and Measurement Traceability Documentation

Contractor-Site Acceptance Testing Completed (190 days)

Submission of Summary Report of Contractor-Site Acceptance Results (195 days)

Submission of Installation Material Data Safety Information to EPA for approval

Equipment Delivery Date Confirmation to EPA (10 days in advance of shipment)

EPA Authorization to Ship

EPA-Provided Contractor Safety Training

Equipment Delivery to EPA (200 days)

Equipment Installation

Equipment Commissioning (215 days)

Final Acceptance Testing (225 days)

Training and Submission of all Documentation (250 days)
Final EPA Approval

ATTACHMENT 3

TECHNICAL EVALUATION CRITERIA

Technical Evaluation Criteria

Engine Emissions Sampling and Analytical Systems for EPA/NVFEL

Evaluation - Commercial Items (FAR 52.212-2) (Jan 1999)

- A. The Government will award a contract resulting from this solicitation to the responsible offeror whose proposal conforming to the solicitation will be most advantageous to the Government, price and other factors considered. The following factors shall be used to evaluate offers: technical proposal, price, delivery, and previous experience.

The following requirements shall be evaluated on a Best Value basis. Offerors shall provide information to demonstrate / substantiate that the proposal meets the minimum requirements.

Offerors shall:

1. Demonstrate that the proposal meets all the minimum requirements of the Government and fulfills EPA's needs as set forth and described in the Statement of Work and Proposal Instructions. Offerors shall discuss all aspects of the Statement of Work requirements. In addition proposals shall explicitly address how the proposal meets or exceeds requirements in the following critical areas:
 - a. Integration and performance of system to provide an effective and workable system.
 - b. Configuration of the exhaust transport, dilution and sample handling systems to minimize system contamination and measurement errors.
 - c. Integration of Safety and Quality Control provisions to assure system integrity.
 - d. Documentation to show that all analytical instruments meet the requirements for accurate and precise low-level concentration measurements.
 - e. Description of auxiliary QC equipment, methods, or analytical techniques that are used to assure system validity and integrity for low level emissions measurements.
 - f. Implementation and integration of all the test data collection, processing, transfer, and reporting methods to assure CFR compliance and to facilitate user-friendly information management tools.
 - g. Physical integration of the measurement system with all aspects of the existing and proposed facility. Preference will be given to systems that do not require significant modifications of the EPA/NVFEL facility.
 - h. Implementation of hardware, software tools and processes that meet any of the provisions of the Statement of Work including those marked as *[Enhancement]*, if applicable. Preference will be given to systems which meet requirements marked *[Enhancement]* in addition to achieving all other requirements of the Statement of Work.
 - i. Demonstration of how the requirements identified in the SOW, such as Section 1.8 (Project Management) will be satisfied to effectively deliver and install required systems. These include, but are not limited to: Project Planning, Scheduling, and Issue Tracking, and an Acceptance Test Plan that addresses Working On-Site at NVFEL, Installation, Commissioning, Acceptance Testing, Warranty, Spare Parts, Documentation, and User Training.

2. Provide information on previous work that demonstrates experience with fabrication and installation of similar equipment to that described in the Statement of Work. Such information may include drawings, photographs, technical data or papers, catalogs, project management information, etc.
3. Submit a list of contracts and subcontracts completed which are similar in nature to this requirement. The contracts and subcontracts listed may include those entered into with Federal, State and Local governments, and commercial businesses, which are of similar scope, magnitude, relevance, and complexity to the requirement which is described in the RFP. Provide for each cited contract and/or subcontract the name of the client and period of performance.
4. Provide detailed project schedule information and affirmative statements regarding the offeror's ability to meet delivery requirements outlined in the Statement of Work.

B. Responses to the above factors shall be evaluated on the following scale:

Unacceptable:	Does not meet all requirements of the SOW.
Acceptable:	Meets all minimum requirements of the SOW.
Superior:	Exceeds the Government's minimum requirements.

C. After the responses have been evaluated against the factors above, an order is expected to be placed with the offeror that represents the **Best Value** to the government. Price may not be the determining factor. Best and final offers should be provided. Discussions may be conducted as necessary at the government's discretion after receipt of quotes and proposals.

D. A written notice of award or acceptance of an offer, mailed or otherwise furnished to the successful offeror within the time for acceptance specified in the offer, shall result in a binding contract without further action by either party. Before the offer's specified expiration time, the Government may accept an offer (or part of an offer), whether or not there are negotiations after its receipt, unless a written notice of withdrawal is received before award.

ATTACHMENT 4

PROPOSAL INSTRUCTIONS

Technical Proposal Instructions

Engine Emissions Sampling and Analytical Systems

General Requirements:

Offerors shall submit one original and three (3) copies of its technical proposal.

In its proposal, offerors shall address all minimum requirements set forth in the Statement of Work, and also explain any way their proposed solutions would enhance the performance of the delivered sampling and analytical systems beyond the minimum requirements. Proposals shall be structured in a manner that clearly and specifically addresses each individual requirement, in the same order and general format in which they are presented in the Statement of Work.

Proposals shall include a list of system electrical requirements, including specific requirements for voltage, amperage, phase and requirements for clean power. The proposal shall include a list of system electrical requirements, including kVA and kW required, amperage per phase, and number of phases required for each type of power. Requirements for any equipment loads exceeding 3kW or loads with high inrush current shall be separately identified in the proposal. Offerors shall identify electrical loads greater than 1kW, and with a power factor less than 0.8 in its proposal. Any unusual requirements for electrical power or equipment grounding shall be identified.

Specific Requirements:

1. Proposals shall address all minimum requirements set forth in the Statement of Work, and also explain any way its proposed solutions would enhance the performance of the delivered sampling and analytical systems beyond the minimum requirements. **Proposals shall be structured in a manner that clearly and specifically addresses each individual requirement**, in the same order and general format in which they are presented in the Statement of Work. Typically, the proposal should include both an affirmative statement and explanation of how the contractor's proposed equipment will meet the requirements. In addition offerors shall include the following information in their response to Technical Evaluation Criteria:

Proposals shall include a Quality Assurance Plan showing how the offeror will assure compliance with contract requirements and how the products delivered will support a system of on-going quality assurance. The contractor shall describe its general approach to run time quality control in their proposals. The specific equipment acceptance requirements contained in Section 6 of the Statement of Work shall be included in the Quality Assurance Plan.

Proposals shall describe how the offeror plans to achieve design goals rated to sampling for low level particulate matter and gaseous emissions.

Offerors shall include in their proposals a summary of its safety, health and environmental considerations. This description shall include measures taken to minimize the energy requirements of the system. Preference will be given to systems which include significant energy saving features.

Offerors shall explain and demonstrate with data, the accuracy and precision of its measurement and data acquisition systems, including all gas analysis instrumentation, flow measurement instrumentation and all related temperature and pressure measurement in its proposal. The contractor shall also describe any averaging/filtering algorithms used in association with the measurement function of their systems.

Offerors shall include a description of other facility related requirements such as temperature, ventilation, etc. in its proposal. This description shall also include data related to any significant heat rejection from any provided equipment. The offerors shall describe and illustrate its proposed test site configurations. Describe and illustrate any special mounting provisions or any associated requirements not provided by the offeror. Describe any other significant, proposed physical

modifications to the test site or facility. Preference will be given to measurement systems which do not require significant modification to the EPA/NVFEL building or facility systems.

Offerors shall describe significant ways that the delivered systems will support operational efficiency, including reliability and maintainability in its proposal. This shall include any significant ergonomic considerations with respect to physical design and layout and clarity and ease of use of operator interface with automated systems. The offeror shall specify recommended maintenance and calibration intervals. Offerors shall describe any additional devices, displays, or controls that enhance the setup, operation, quality, safety, and efficiency of the system and can be integrated with the delivered system.

Offerors shall provide a complete description of computer hardware and operating software in its proposal. The offeror shall detail its proposed computer system interface design and protocols, and describe the ease with which the provided measurement system can be interfaced to and controlled by the test cell controllers identified in the Statement of Work.

Proposals shall include a comprehensive explanation of the management of the project, including a Gantt chart showing major milestones, personnel support plan, plan for quality assurance of all deliverables and monitoring and managing all key activities including installation. Offerors shall outline their complete warranty provisions and recommended maintenance and calibration intervals in its proposal.

2. In its proposal, offerors shall provide evidence that its measurement systems have general acceptance in laboratories performing functions closely associated with engine emissions testing and the functions described in the Statement of Work.
3. Offerors shall list at least three different certification test laboratories using similar systems for emissions and related measurements. This listing shall include a brief description of each system.
4. Proposals shall include detailed project schedule information and affirmative statements regarding the offerors ability to meet delivery requirements.

ATTACHMENT 5

QUALITY ASSURANCE PLAN

Quality Assurance Plan
Engine Emissions Sampling and Analytical Systems
for EPA NVFEL

The contractor shall provide Engine Emissions Sampling and Analytical Systems with required documentation in accordance with the attached Performance Work Statement. Required delivery date is 260 days after award of contract for commissioning of HD2 and HD5, and 300 days after award of contract for Final Acceptance Testing Reports for HD2 and HD5. EPA desires a quicker response and is negatively impacted by a longer response. As such, earlier delivery of the commissioned test cells is to be incentivized and late delivery of the Final Acceptance Testing Reports is to be disincentivized. The chart below details the monetary plan for earlier, timely, and late delivery.

<u>Deliverable</u>	<u>Receipt of Deliverable</u>	<u>Incentive</u>	<u>Surveillance Method</u>
Delivery shall be considered when the receipt date of the commissioned Test Cells HD2 and HD5, as set forth in the Statement of Work has been accomplished.	215 - 260 days	For each day of delivery prior to the 260 day delivery requirement (but no earlier than 215 days after contract award), the contractor will earn \$2,000 per day.	The contractor will be notified the day of award. The day following contract award will be considered Day 1. Delivery shall be considered the receipt date of the commissioned Test Cells HD2 and HD5, as set forth in the Statement of Work.
<u>Deliverable</u>	<u>Receipt of Deliverable</u>	<u>Disincentive</u>	<u>Surveillance Method</u>
Delivery shall be considered the receipt date of the Final Acceptance Testing Reports for HD2 and HD5 that clearly and completely demonstrates that all system requirements, as set forth in the Statement of Work, are received by EPA.	301 - 371 days	For each day of delivery after the 300 day delivery requirement (but no later than 371 days after contract award), the contract price will be reduced by \$1,000 per day.	The contractor will be notified the day of award. The day following contract award will be considered Day 1. Delivery shall be considered the receipt date of the Final Acceptance Testing Reports for HD2 and HD5 that clearly and completely demonstrates that all system requirements, as set forth in the Statement of Work, are received by EPA.

ATTACHMENT 6

CONTRACT LINE ITEMS

Line Item	Description	Qty	Units	Unit Price	Total Price
BASE					
0001	Engine Emissions Sampling and Analysis System for Heavy Duty Engine Test Cell 5 in accordance with the attached Statement of Work.	1	Lot		
0002	Raw Emissions Analysis System for Heavy Duty Engine Test Cell 2 in accordance with the attached Statement of Work.	1	Lot		
0003	Engine Emissions Sampling and Analysis Support Equipment in accordance with the attached Statement of Work.	1	Lot		
0004	Installation, Setup, Acceptance Testing, Documentation, Warranty, Spare Parts, and Training in accordance with the attached Statement of Work.	1	Lot		
OPTIONS					
0005	Additional Dilute Exhaust Gas Analysis System in accordance with the attached Statement of Work.	1	Each		
0006	Additional Raw Exhaust Gas Analysis System in accordance with the attached Statement of Work.	MAX 2	Each		
0007	Add Sulfur Dioxide Analyzer to Each Analysis System in accordance with the attached Statement of Work.	MAX 6	Each		
0008	Add Engine Exhaust Gas Recirculation (EGR) determination for Raw Engine Exhaust Gas Analytical Systems in accordance with the attached Statement of Work.	MAX 4	Each		
0009	Add Modal Mini-Diluter (MMD) for Raw Engine Exhaust Gas Analytical Systems in accordance with the attached Statement of Work.	MAX 4	Each		
0010	Add Gaseous Sample Source Switching for Raw Engine Exhaust Gas Analytical Systems in accordance with the attached Statement of Work.	MAX 4	Each		
0011	Additional Particulate Matter, Secondary Dilution and Sampling System in accordance with the attached Statement of Work.	MAX 3	Each		
0012	Extended Warranty for 2nd Year after Acceptance Date in accordance with the attached Statement of Work.	1	Year		

Line Item	Description	Qty	Units	Unit Price	Total Price
0013	Extended Warranty for 3 rd Year after Acceptance Date in accordance with the attached Statement of Work.	1	Year		
0014	Extended Warranty for 3 rd Year after Acceptance Date in accordance with the attached Statement of Work.	1	Year		
0015	Extended Warranty for 3 rd Year after Acceptance Date in accordance with the attached Statement of Work.	1	Year		